ELECTRICAL CONSTRUCTION AND MAINTENANCE

949
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APRIL • 1949

Featuring

Terrace Plaza of Cincinnati . . . . . page 65
Electrical Radiant Heating . . . . . page 74
Fire Alarm Layout . . . . . page 76
Industrial Kitchen . . . . . page 78
Harvard Relights Baker Library . . . . page 80
Enclosed Motors Need Drains . . . . . page 84

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0.25 to 10 kva. For indoor or outdoor use.

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15 kva and up. For indoor service.

GENERAL ELECTRIC M and D dry-type transformers go up in a hurry! And once installed, you won't have to think about them—operating records from hundreds of plants show they require practically no inspection or maintenance.

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GENERAL ELECTRIC

411-47

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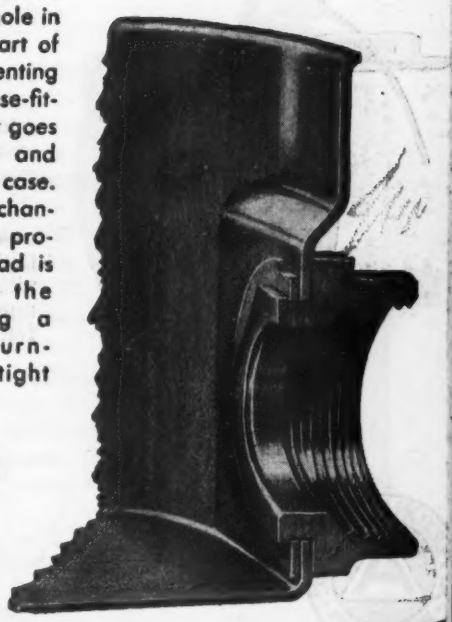

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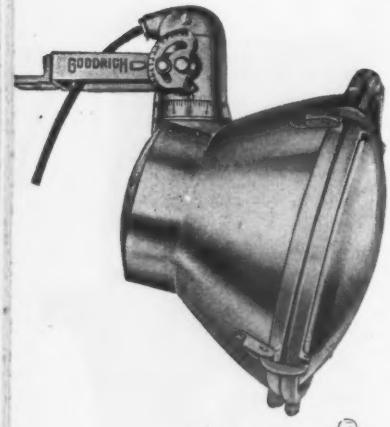

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April • 1949

APRIL—at a glance 61

Signal Prospects 63

Terrace Plaza of Cincinnati 65
By ARTHUR E. BERTKE—Some interesting features from one of the most outstanding electrical construction jobs in America.

Electrical Radiant Heating 74
Methods and practices for designing, installing and wiring resistance type electrical space heaters.

Fire Alarm Layout 76
By A. A. SCHUHLER—Considerations for planning, designing and installing typical fire alarm systems.

Industrial Kitchen 78
By HUGH P. SCOTT—A completely-electrified kitchen promotes service and safety in a leading east coast industrial plant.

Harvard Relights Baker Library 80
By JOHN A. BERNARD—Modern new lighting system provides high intensity of shadowless and glarefree illumination in Harvard University's Baker Library reading room.

Lustron Installs Electric Furnaces 83
Two new Lindberg electric furnaces will speed up porcelain enameling of new Lustron house panels.

Enclosed Motors Need Drains 84
By J. M. HILLMAN—Enclosed, fan-cooled motors "breathe". Resultant condensation in humid atmospheres must be drained from motor frames.

Industrial Electrification 115
Bus Duct Distribution—Part II

Departments

Practical Methods 87
Equipment News 97
Motor Shops 107
Reader's Quiz 120
Modern Lighting 135
New Literature 147
Questions on the Code 151
In the News 157
Advertisers' Index 188

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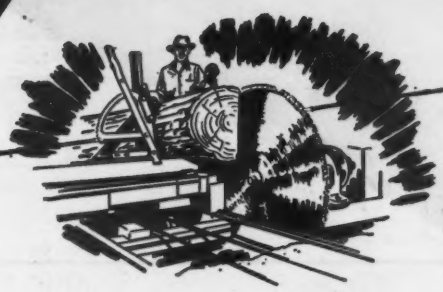

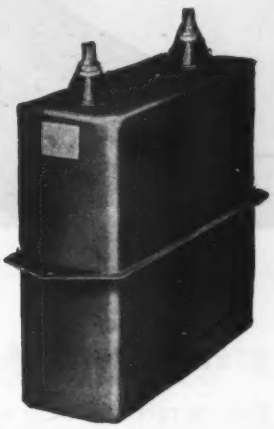

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From the Inman Poulsen Lumber Co., in Portland, Oregon, comes this story: A check showed that they were paying a relatively high rate for power because of poor power factor—common whenever induction motors run partially loaded. In June, 1947, they installed G-E Pyranol® capacitors on individual motors, or near them. Power factor was raised from 57% to about 90%. The $10,000 cost for capacitors, installed, will be saved in lower power bills in approximately three years.

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GENERAL ELECTRIC

407-186

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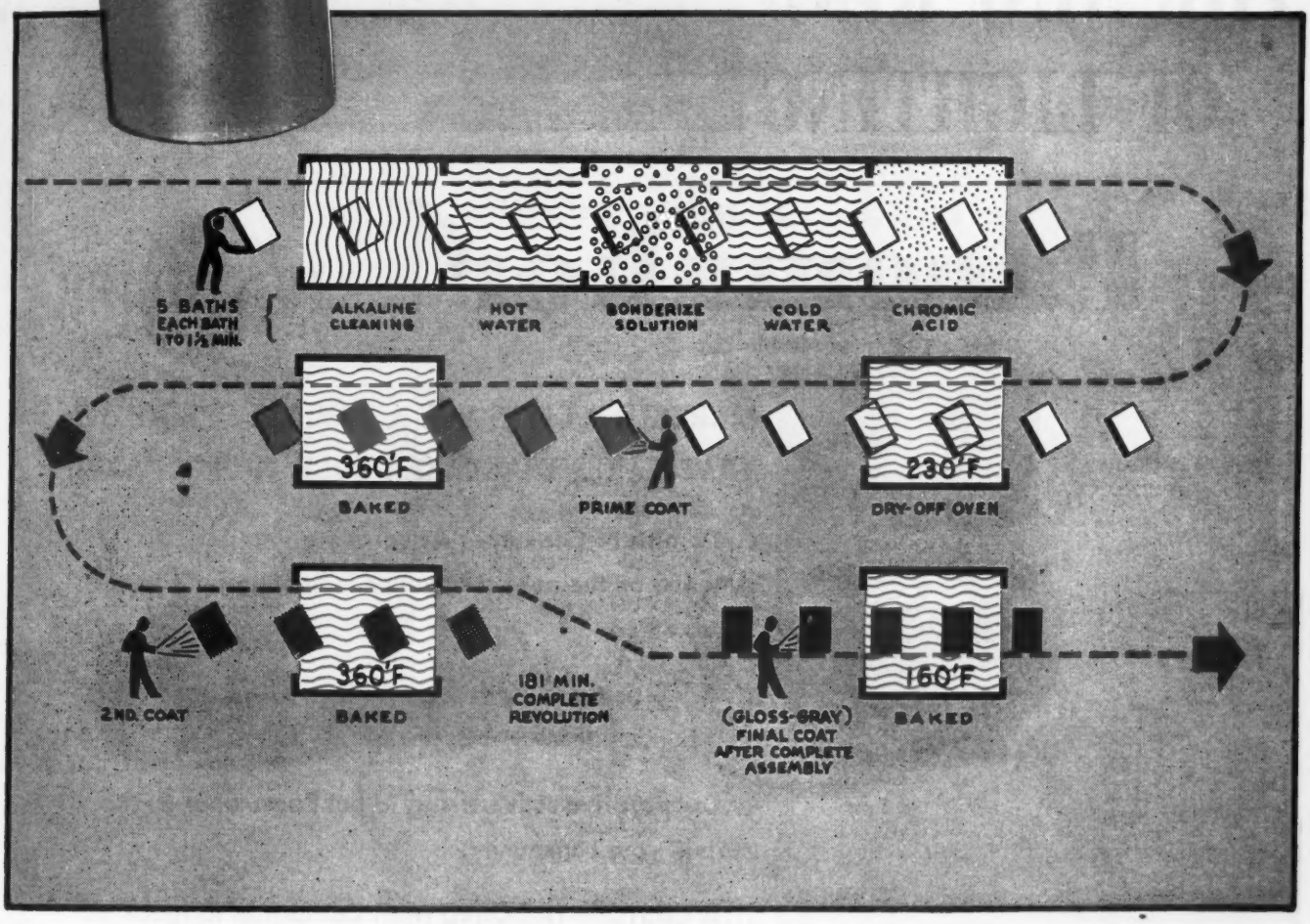

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Because this coating is bonded integral with the metal, it effectively retards corrosion, even in the extreme case of abrasion or scratching of paint film. After Spra-Bonderizing, tank gets three coats of tough, baked-on enamel.

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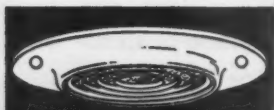

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P-G

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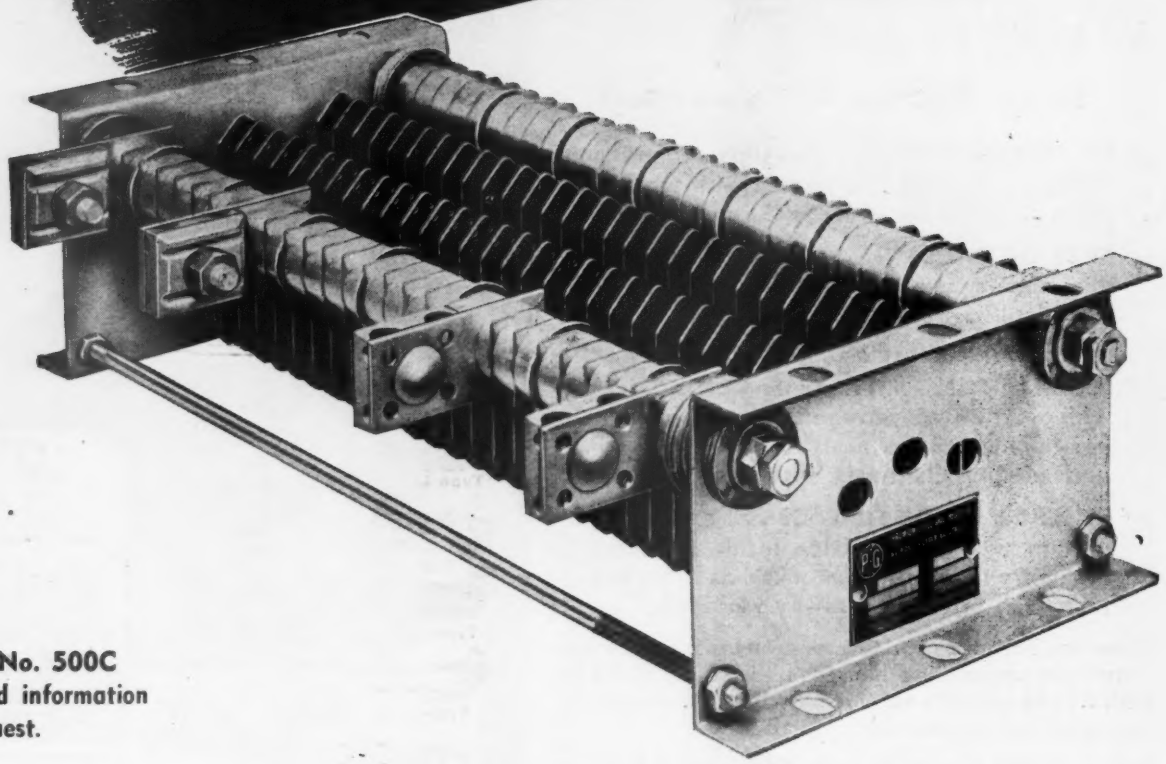

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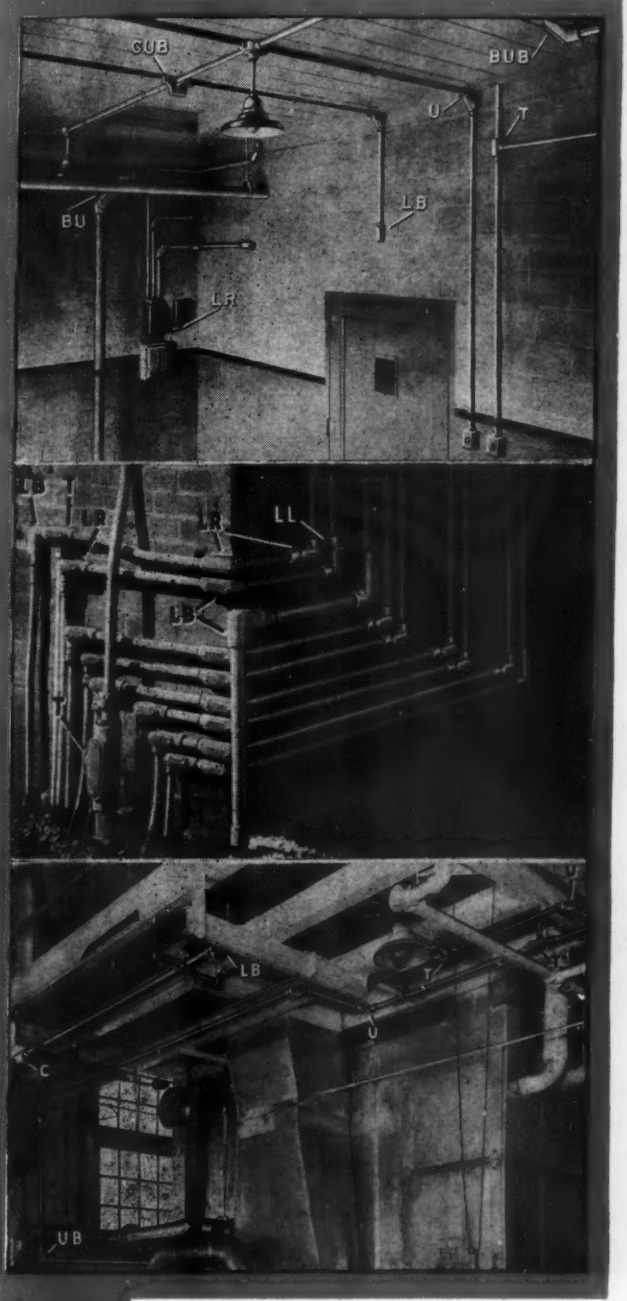
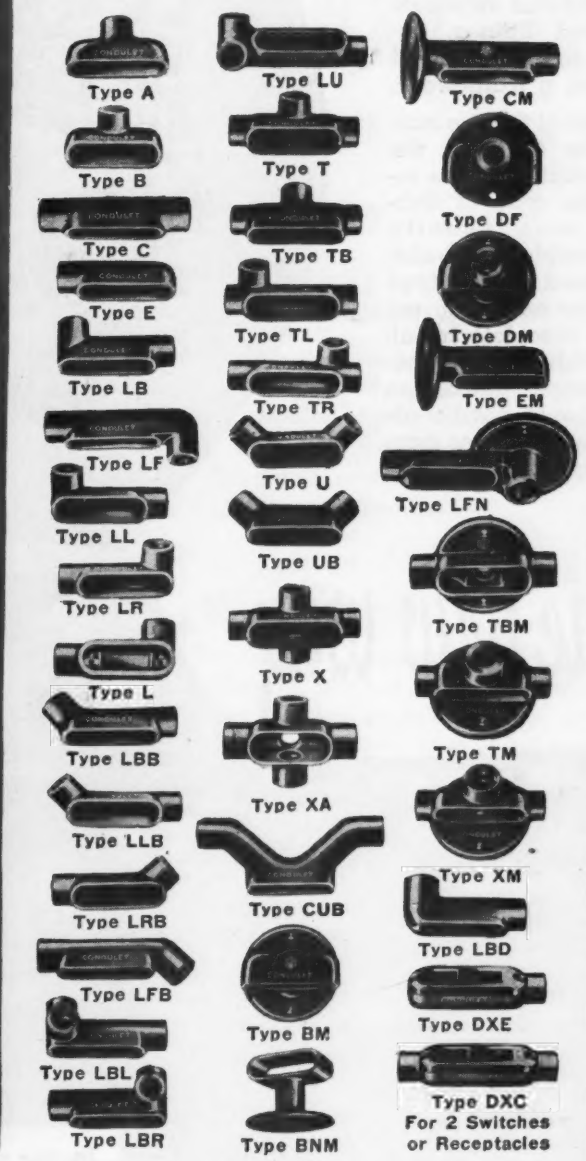
because they are so handy and there are

49 different types

A wide variety of interchangeable covers and wiring devices with Crouse-Hinds' exclusive Wedgenut Fastener; sizes to fit ½ to 6-inch electrical conduit.





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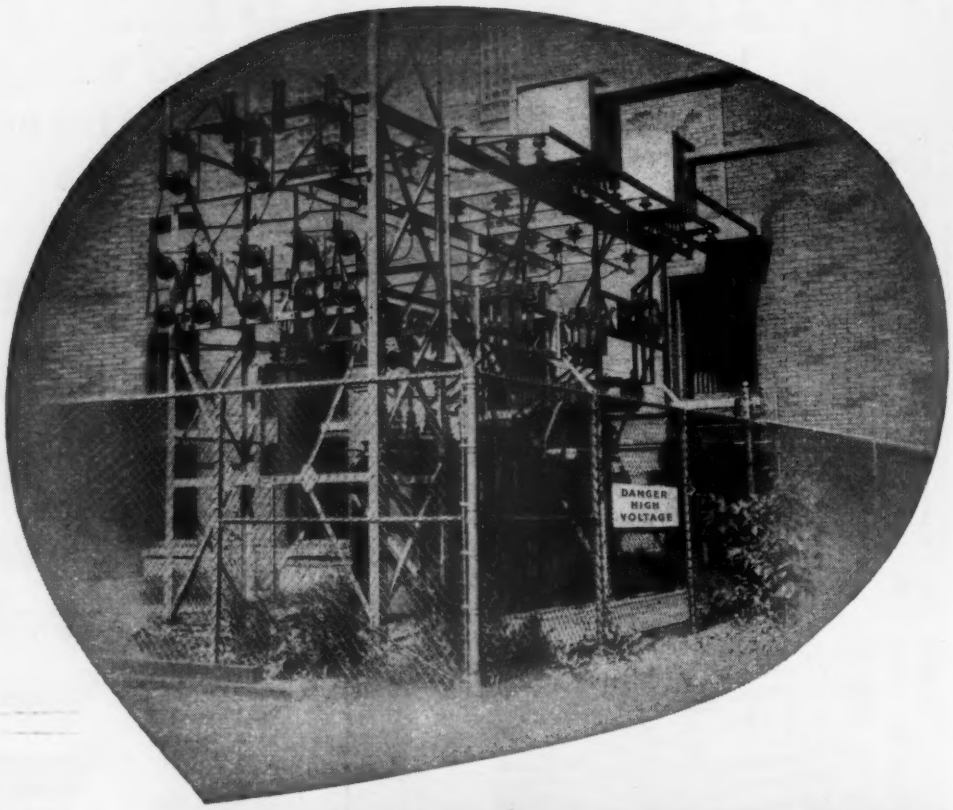

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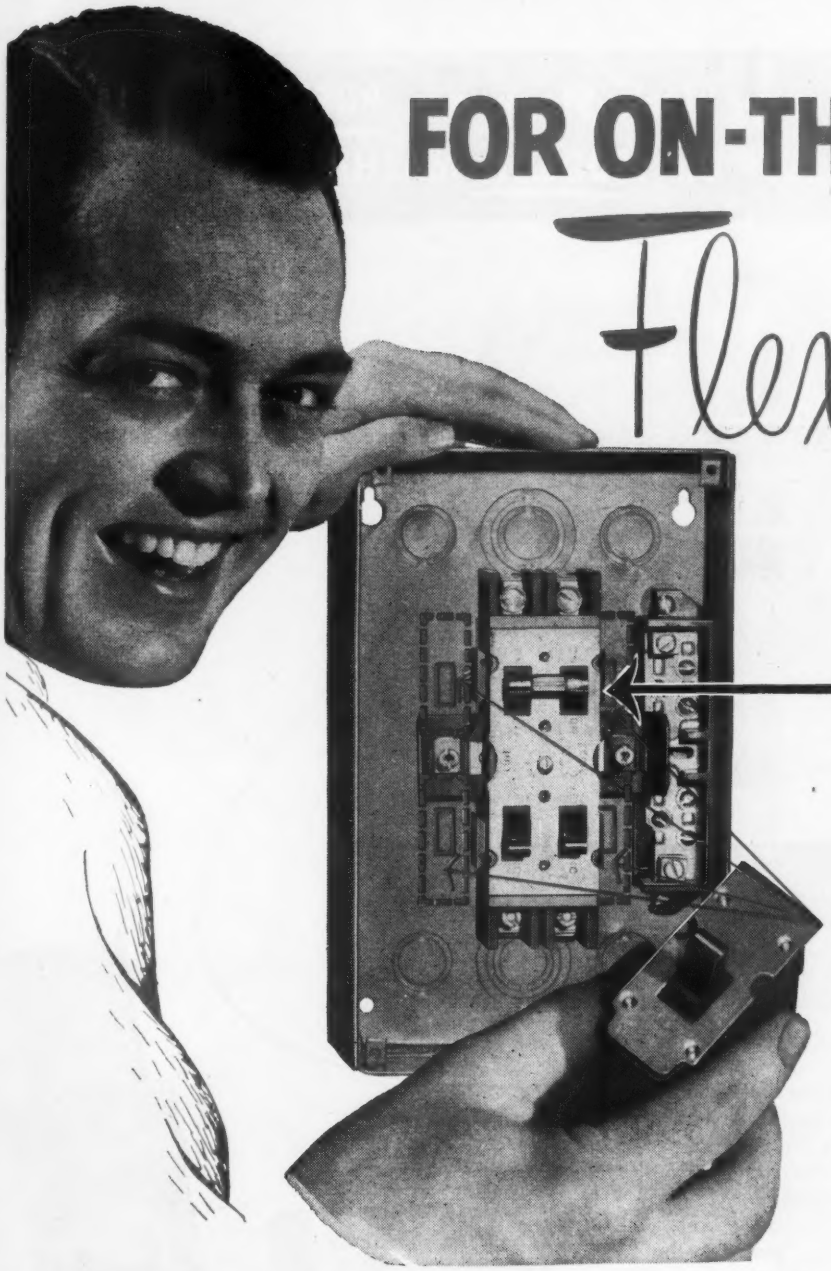
The Cutler-Hammer MB-4 Multi-Breaker



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This is the
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These are the units
ADDED ON THE JOB

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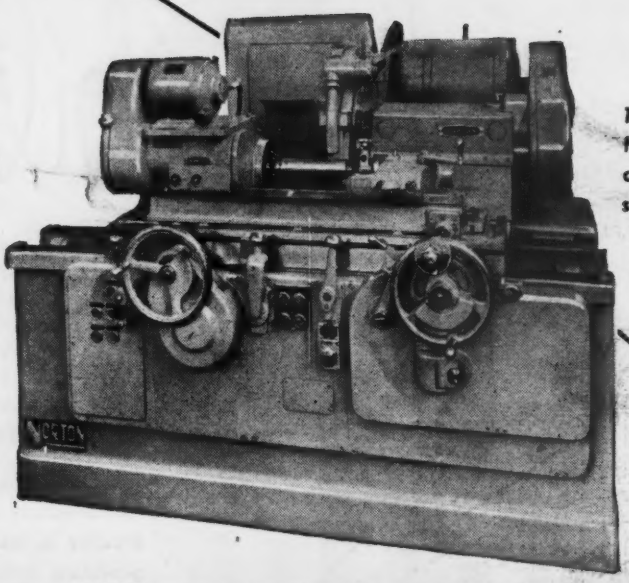
MULTI-BREAKER
C-H

NEW ELECTRICAL DEVELOPMENTS

#6

Unnecessary Work Stoppages PREVENTED ON MODERN MACHINES



The New Norton Type CTU cylindrical grinders feature high production, simplicity of controls and adjustments, accuracy of sizing, and accessibility of mechanisms for maintenance service.

by modern ECONOMY "de-lay" fuses

Interruptions to the operation of this high-production-capacity Norton Grinder are costly. Hence the need for preventing unnecessary interruptions to the electrical current which operates it.

ECONOMY "De-Lay" Fuses, which protect against unnecessary "blows" in the 135 to 200% range, handle this situation to perfection. While always protecting against excess current, they do not "blow" and cause shutdowns when subjected to momentary current surges that will not cause damage to electrical equipment.

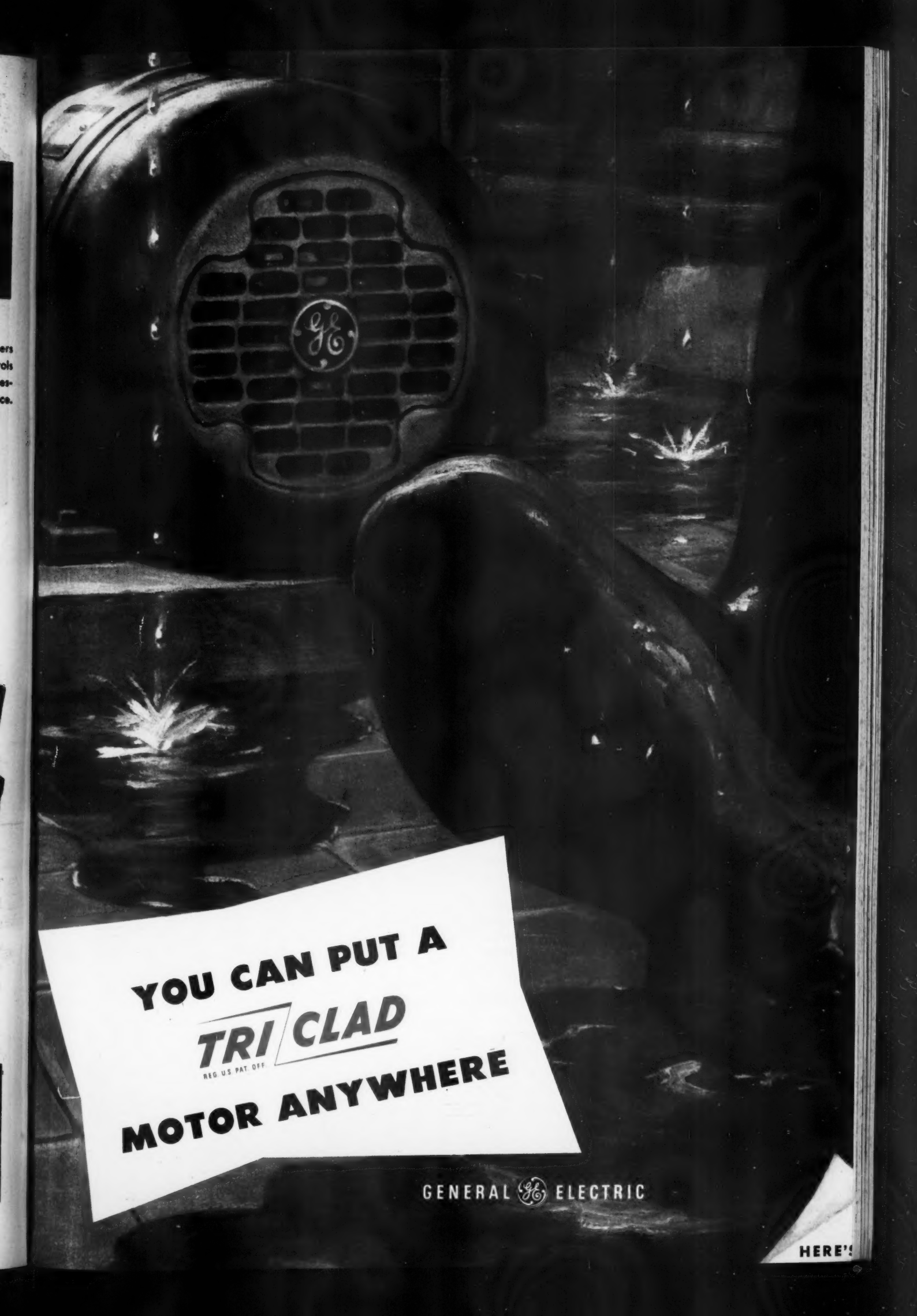
Ask your Electrical Wholesaler to supply you with ECONOMY "De-Lay" Renewable Fuses and Renewal Links.

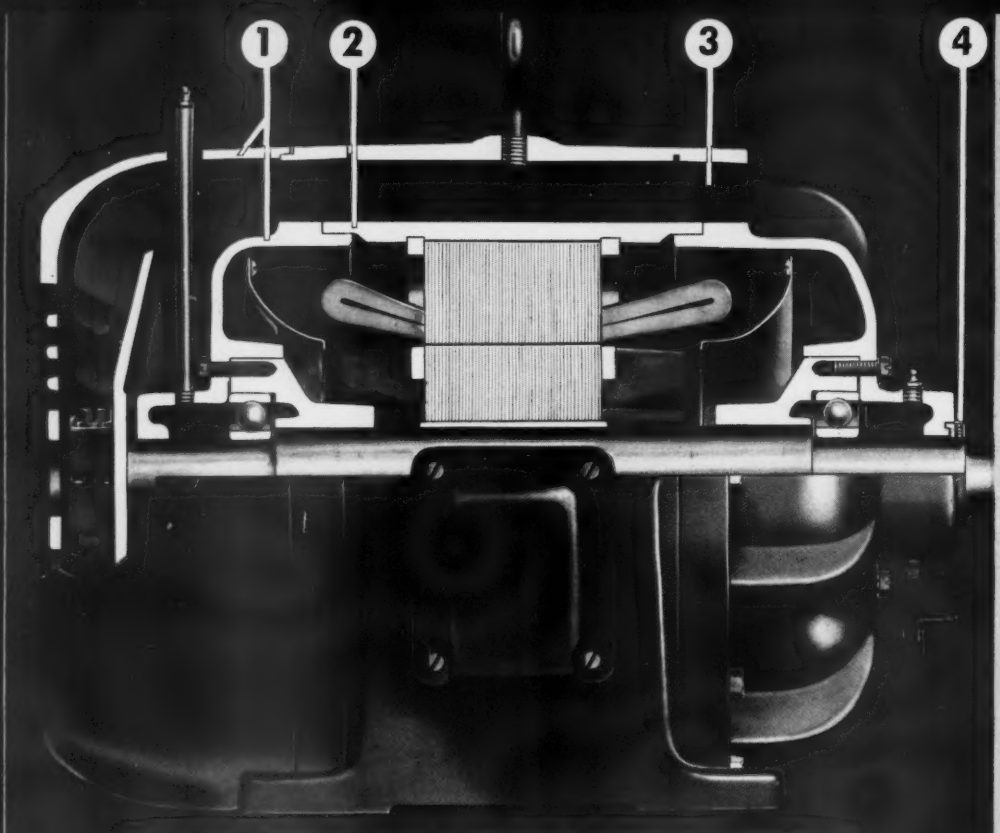
You are invited to write for the New Economy Catalog.

ECONOMY DE-LAY RENEWABLE CARTRIDGE FUSES

3063

ECONOMY FUSE & MFG. CO., 2717 GREENVIEW AVE., CHICAGO 14, ILL. REPRESENTATIVES IN ALL PRINCIPAL CITIES


YOU CAN PUT A
TRI CLAD
REG. U.S. PAT. OFF.
MOTOR ANYWHERE
GENERAL ELECTRIC
HERE'S



The standard totally enclosed Tri-Clad features a *cast-iron* double-wall structure (1) that keeps outside air from electrical operating parts . . . machined-fit end shields (2) . . . large air passages (3), easy to clean . . . rotating labyrinth seals (4) that keep foreign matter from working in around the shaft. Note, too, the new corrosion-resistant G-E Textolite cooling fan is now standard on all 1- to 15 hp TEFC Tri-Clads.

You can put a TRI CLAD motor anywhere

YES SIR! The standard *Tri-Clad* open motor is a *cast-iron, dripproof* motor you can put anywhere that *any* open motor can be used—and in a lot of places where other open motors couldn't take it.

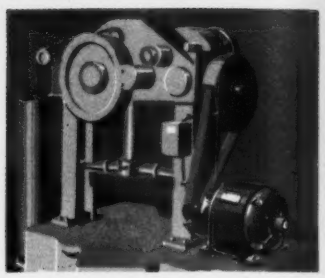
What's more, for the really dirty jobs—where air is laden with dust, or corrosive fumes—where metal chips and cutting fluids abound—the Tri-Clad totally enclosed motor gives you more protection, *inside and out,* than any other make of motor you can buy.

1,720,000 Tri-Clad motors, operating in every conceivable kind of plant, prove the far-reaching advantages of cast-iron construction . . . superior resistance to corrosion . . . rigidity that makes for permanent shaft alignment . . . inherent damping action that minimizes noise and damaging vibration. These motors prove, too, that Tri-Clad double-end ventilation simply has no equal for prolonging an open motor's useful life. Providing high-volume, relatively low-velocity cooling, this ventilating system keeps Tri-Clad motors *uniformly* "air-conditioned".

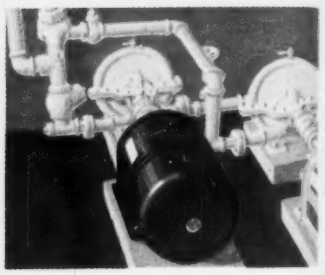
WANT MOTORS THAT CAN REALLY TAKE ABUSE? Tri-Clad motors in nearly all types and ratings are available for **IMMEDIATE SHIPMENT.** Contact your nearest G-E Office or write *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

There's a Tri-Clad motor for every industrial need!

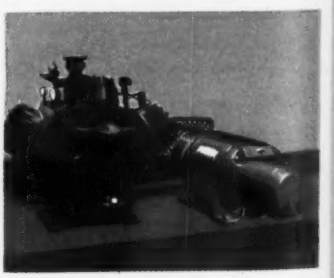


G-E open (dripproof) induction motors for constant-load, constant-speed applications. From 1 to 2000 hp.



G-E totally enclosed motors for outdoor operation, in abrasive dusts, or corrosive fumes. From 1 to 1000 hp.

G-E gear-motors for low-speed operation. A normal-speed motor with built-in reduction gear. From ⅛ to 75 hp.



G-E synchronous motors for maintaining exact speeds or for correcting power factor. From 20 to 1000 hp.

YOU CAN'T BEAT TRI CLAD REG. U.S. PAT. OFF.

EXTRA PROTECTION

Leader Fluorescent SPOTLINE

● Architects, lighting engineers, store designers, builders, and merchandisers all say Aye! to LEADER "eyes"—the powerful spotlights that dramatize merchandise so alluringly.

Yes, the new, inverted formula for sales success is to begin at the top and work down! To this end we invite YOU to install your star salesmen in the ceiling. Cash registers are proving the soundness of this advice: Hire LEADER Fluorescent SPOTLINES to put new pep into profits without adding a penny to the pay-roll.

NEW!
75 Watt New Horizon Series
Features the new T-12, 75 watt tube. A very important addition to the Leader New Horizon line. 425 milliampere operation. Increases light output in offices, stores, schools, etc. Underwriters' Laboratories approved. Available in 2-lamp (NHC 280-F), 4-lamp (NHC 480-F) and 6-lamp (NHC 680-F) units. A marked advance in lamp performance. Write for full information.

SPECIFICATIONS:

LEADER SPOTLINE: A combination of Leader "New Horizon" Slimline fixtures fitted with Leader "Direclite" spotlights. Direclites are adjustable for lighting angles and are fitted between fixtures in continuous runs.
For complete details see Page 7 of the new, 1949 Leader catalog.

Sold and installed only by the better electrical wholesalers and contractors.

"A STEP AHEAD" LEADER ELECTRIC COMPANY

Send for Complete Details

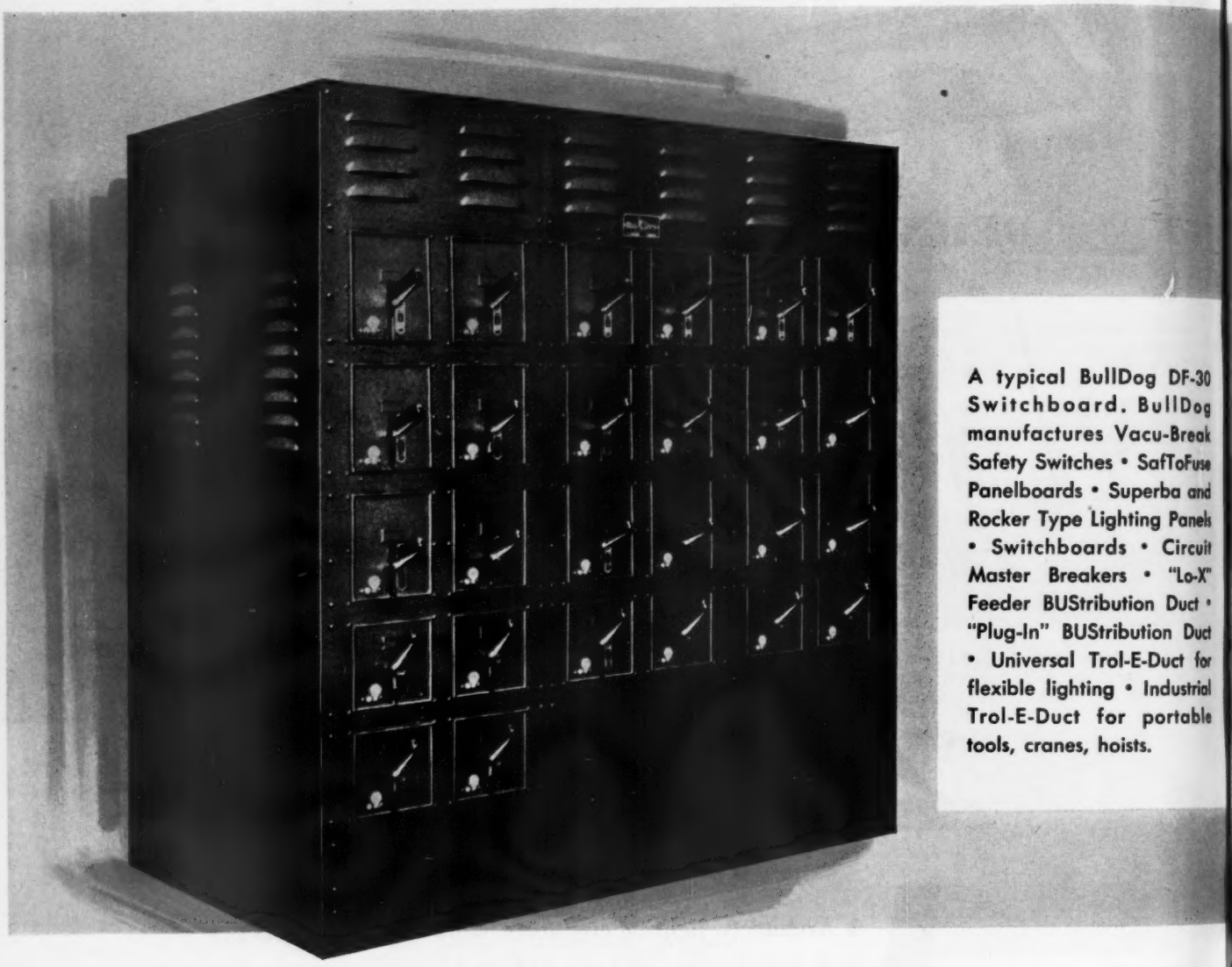
LEADER ELECTRIC COMPANY

3500 NORTH KEDZIE AVENUE • CHICAGO 18, ILLINOIS

West Coast Factory: 2040 Livingston Street, Oakland 6, California

ELECTRICAL CONTRACTORS

This message will also appear in a broad list of publications that are



A typical BullDog DF-30 Switchboard. BullDog manufactures Vacu-Break Safety Switches • SafToFuse Panelboards • Superba and Rocker Type Lighting Panels • Switchboards • Circuit Master Breakers • "Lo-X" Feeder BUStribution Duct • "Plug-In" BUStribution Duct • Universal Trol-E-Duct for flexible lighting • Industrial Trol-E-Duct for portable tools, cranes, hoists.

Master-control engineered

MEET the switchboard that considers both today and tomorrow in bringing you power control . . . the BullDog DF-30 type. Engineered to your present needs, it is still flexible enough to take future changes in stride.

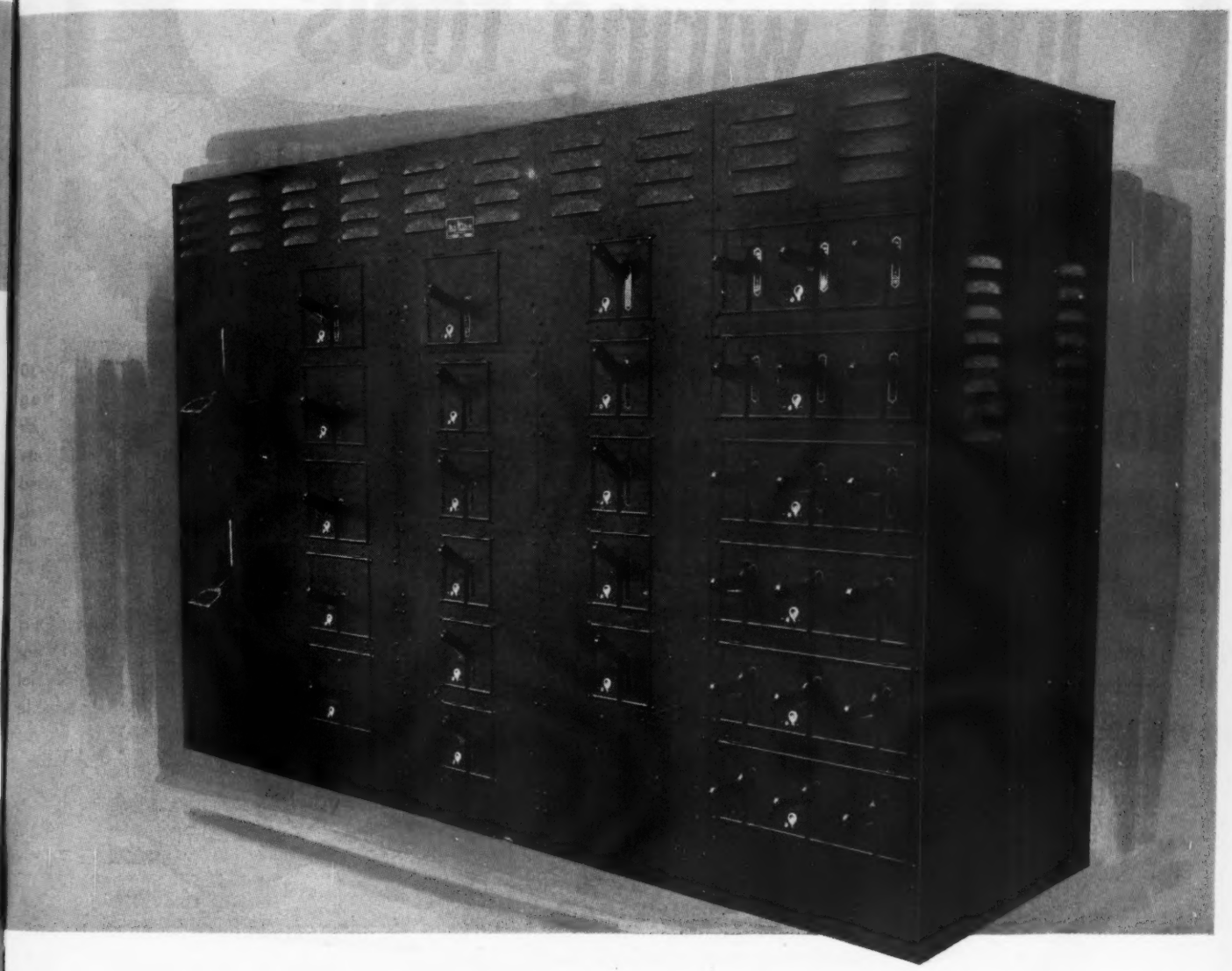
BullDog DF-30 Engineered Switchboards are constructed compactly, but provide spare space for possible extra requirements later on. In addition, individual switch units are interchangeable, making possible quick replacements when circuit loads change.

Switch units in DF-30 Switchboards are the famous BullDog SAFtoSWITCH units, approved by Underwriters for all sizes from 30 to 1200 amperes inclusive, 600 volts and less.

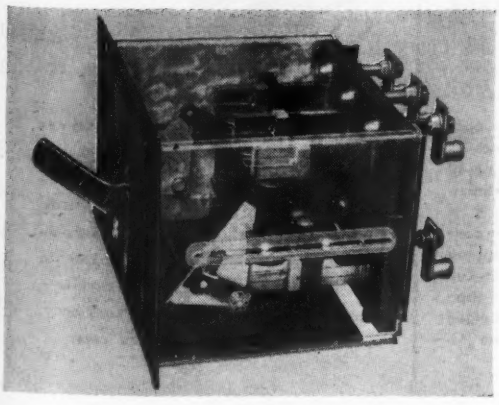
SAFtoSWITCH units in BullDog DF-30 Switchboards have ball-bearing action, greatly reducing friction. Quick, simultaneous double-break switch action cuts dangerous arcing. In "OFF" position, both "line" and "load" are disconnected, eliminating feedbacks.

Main circuit-breaker protection, transformers and metering equipment can be built into your DF-30 Switchboard. Ask your local BullDog Engineer for full information.

read by the men you seek to influence . . . your prospective customers.



to your plant problems



Phantom view of a DF-30 SAFtoSWITCH unit, showing the frictionless ball-bearing guide mechanism. Separate fuse and switch compartments prevent accidental contact with live parts while replacing fuses. In OFF position, fuses are disconnected from both "line" and "load".

BullDog Field Engineers welcome the opportunity to sit in with you during the early planning stages of a building project. Their knowledge of electrical distribution layout can mean savings in installation costs, as well as efficiency and reliability in actual operation. Why not take advantage of this service?

BULLDOG ELECTRIC PRODUCTS COMPANY

DETROIT 32, MICHIGAN • FIELD OFFICES IN ALL PRINCIPAL CITIES

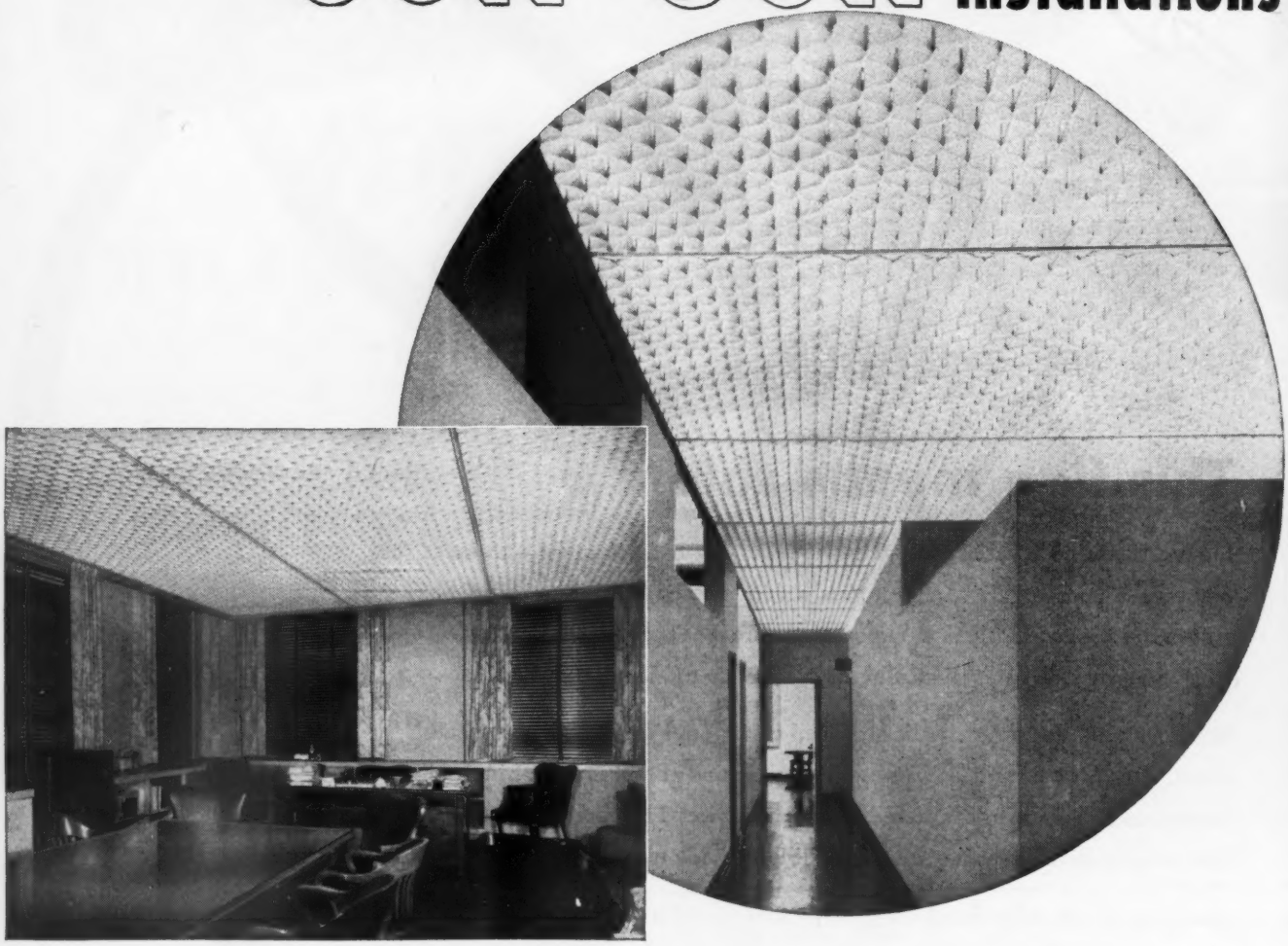
IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO

BULLDOG

HEADQUARTERS FOR ELECTRICAL DISTRIBUTION

Lighting sales *GOING UP* with

FEDERAL Cell-Ceil* Installations



Foyers, display rooms and offices are taking on new life and glowing beauty with the application of Federal Cell-Ceil, the most modern lighting treatment. And, these installations are pushing lighting sales higher every day.

This beautiful overall ceiling louvering is easy to install. The light-weight sturdy hanging mechanism developed for Cell-Ceil not only speeds up application but provides such easy access for relamping and cleaning that continued customer satisfaction is assured.

Your customers are being told about Federal Cell-Ceil through full page advertisments every month in Architectural Forum, Architectural Record, Progressive Architecture and Interiors.

Increase your lighting sales—be ready to deliver Federal Cell-Ceil now! The Federal engineering staff will gladly advise on any installation problem. Our technical bulletin on installation techniques is also available, address Dept. CC-2.

*Trade Mark "Cell-Ceil" applied for.

FEDERAL ENTERPRISES, INC.

Formerly: FEDERAL ELECTRIC COMPANY, INC.

8700 S. STATE STREET • CHICAGO 19, ILLINOIS

You know you're right with "G-E White"

Each step in the manufacture of General Electric White rigid conduit, from raw material to final inspection, is carefully controlled to bring you a uniform, high-quality product. Interior and exterior surfaces are smooth . . . threads are sharp and clean-cut. Finish is hot-dipped zinc, with an additional coating of baked-on Glyptal lacquer.

Always, when you think of conduit for protection from atmospheric corrosion, think of "G-E White." For further information, see your nearest General Electric Construction Materials distributor, or write to Section C14-418, Construction Materials Department, General Electric Company, Bridgeport 2, Connecticut.

*Trade-mark Reg. U. S. Pat. Off.

RACEWAYS ROUNDUP

with your

GENERAL ELECTRIC

Construction Materials Distributor

If you're wondering how to get raceway protection for wiring in cramped quarters, for machine tool or temporary wiring, General Electric flexible steel conduit is the answer. This conduit is strong, yet very flexible. It's quickly installed, and the zinc-coated strip steel is wound in a way that makes wire pulling easy.

Don't forget General Electric EMT for those light jobs that don't require the heavy-duty protection of rigid conduit. You'll like the way lightweight EMT can be easily handled . . . easily bent . . . quickly installed with threadless fittings. This thin-wall, welded steel tubing has an exterior surface of electrogalvanized zinc and an interior of corrosion-resisting enamel.

General Electric switch and outlet boxes are made in a variety of sizes, shapes, and depths for every purpose. Most are available either galvanized or with black-enamel finish. All cable and conduit boxes have improved knockouts, are easy to install, and have the approval of Underwriters' Laboratories, Inc.

On your next order, why not try the time-saving, "one-stop, one-package" service that your General Electric distributor can supply? Because he carries the complete General Electric line, you can order every item you need from him. No need to run around getting part of your requirements in one place and part in another. It's the kind of service busy contractors need to help stretch scarce working hours.

GENERAL ELECTRIC

Conduit Products

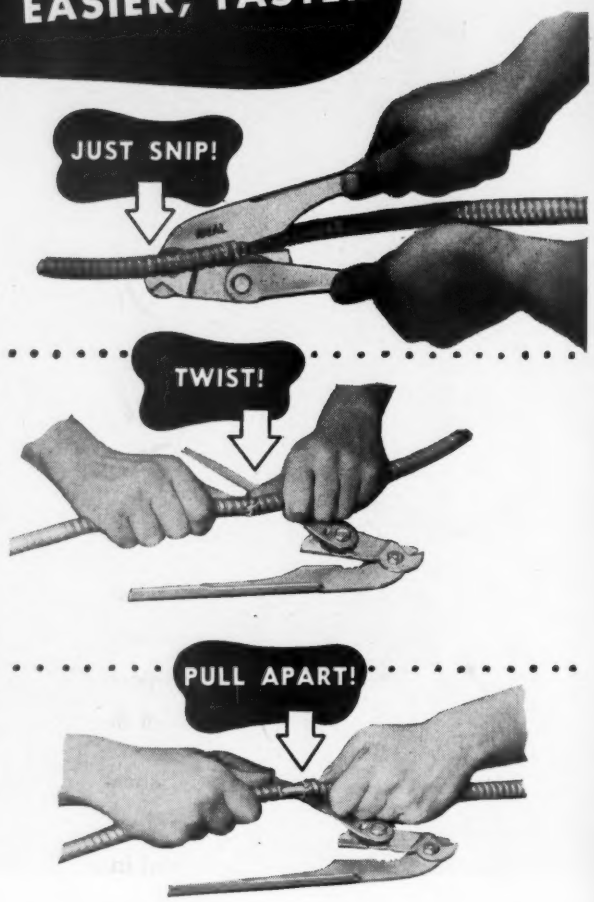
IDEAL wiring tools

MAKE EVERY WIRING JOB EASIER, FASTER

NEW

IDEAL B-X Armor Cutter

Makes B-X Cutting SAFE. Eliminates hacked and torn fingers—cut and damaged insulation. There's no other tool like it! You just place the cable in the jaws and squeeze handles—then twist the cable and pull apart. Use it for either new small diameter or large diameter B-X, No. 10, 12, or 14 (two or three wire) cable. Cuts anywhere along length of cable for opening into junction boxes, etc. Gets into hard-to-reach places. Special steel cutting blade may be sharpened. 10 inches long; weighs Just 12 ounces. End of tool serves as wire cutter. *See and get one today!*



IDEAL Wire-Nut®

Patented, No. 1,933,555

(THE SOLDERLESS, TAPELESS WIRE CONNECTORS)

THE SIMPLEST, BEST WAY TO MAKE APPROVED WIRE JOINTS

Preferred over all other types because they are FASTER, BETTER—and they cut wiring costs! *Faster* — just screw them on—that's all. No solder, no tape, no tools. *Better* because they make a joint that's stronger, electrically better and more permanent. Can't shake or pull loose. Bakelite shell insulates and covers sharp wire ends. Built to highest precision standards—every one inspected! For all common wire joints from two No. 18 up to three No. 10, solid and/or stranded. Look for the name "IDEAL".

FISH TAPE REEL AND PULLER

3 tools in 1. Gives complete control of fish tape . . . keeps it reeled up . . . prevents springing and breaking . . . helps workmen avoid "live" parts. Makes it a "breeze" to pull tape through conduit. Gives BIG grip. No slipping —easy to reel in or pay out. Six stock sizes. Cuts "fishing" time 50%. Tape is reeled, unreeled and/or pulled through in one direction.

IDEAL VOLTAGE TESTER

Many superior features! Gives DOUBLE PROTECTION—a solenoid indicator and neon test lamp. Not an ordinary "glo" type—actually indicates nominal line voltage on easy-to-read scale, calibrated from 110 to 600 volts. Tests AC or DC circuits—grounds — blown fuses — frequency, etc. Complete with carrying case.

SEE YOUR LOCAL IDEAL DISTRIBUTOR—OR WRITE US

IDEAL

IDEAL INDUSTRIES, Inc. Sycamore, Illinois

This flag means safety

VINYLITE Brand Plastics have what it takes – and a lot more – to meet the rigorous Underwriters' Laboratories safety specifications for wire insulation... specifications so important to fire prevention! The molded-on plug, making it an integral part of the cord set, is an added safety feature.

Whether used for non-metallic sheathed cable, appliance cords, or portable cords, VINYLITE Brand Plastics readily withstand the pulls, crushing, impact and abrasion encountered in actual service. They are flame-resistant. The smaller diameters they make possible provide more circuits per conduit.

Available in any color for decoration or identification, VINYLITE Brand Plastics are resistant to water, oils, greases, alkalis, and most acids. They are easy to pull and strip. Aging is no problem.

Full information on VINYLITE Plastics insulation is a "must" to anyone engaged in building, remodeling, or rewiring residential and business structures. For a list of manufacturers who now use VINYLITE Brand Plastics insulation, write Department EY-41. Technical representatives are available to industrial organizations for consultation on wire and cable problems.

Vinylite BRAND PLASTICS

BAKELITE CORPORATION

BAKELITE CORPORATION, *Unit of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N. Y.

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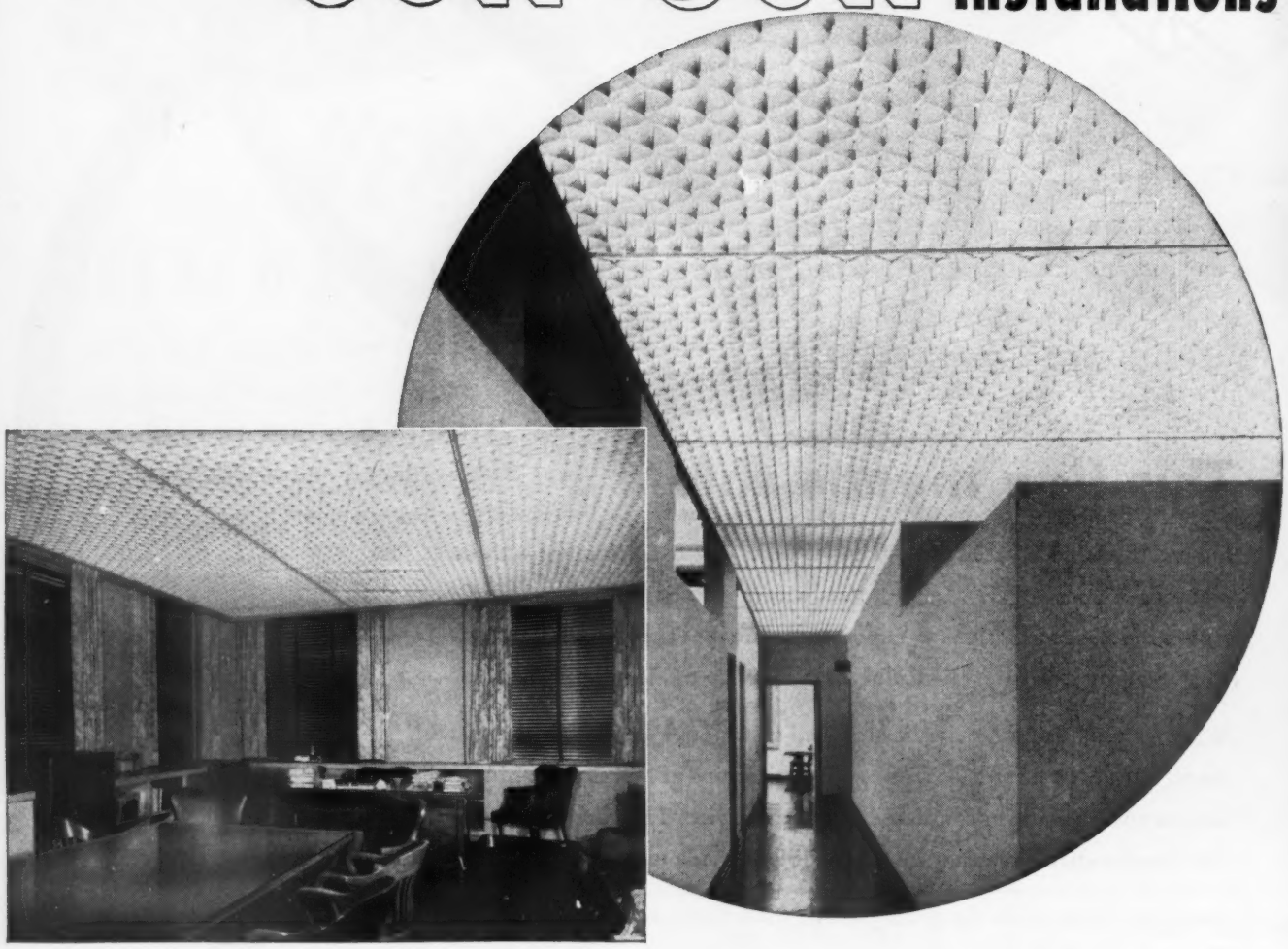

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GENERAL ELECTRIC

Conduit Products

9 speeds forward!

NEW EXCLUSIVE PROFIT FEATURE

Mr. Contractor: Here is a new feature that will help you sell more Blo-Fan electric *ceiling* ventilators. The new nine position control switch enables the housewife to choose the desired rate of ventilation as easily as she controls the thermostat on her kitchen stove. Send coupon to obtain information about this new feature found only on the Model 210 Blo-Fan.

Please send me detailed information on the Blo-Fan nine speed control switch and names of local distributors.

NAME_____

ADDRESS_____

CITY_____ STATE_____

STOCKED IN 300 CITIES BY 500 FRANCHISED DISTRIBUTORS.

Blo-Fan

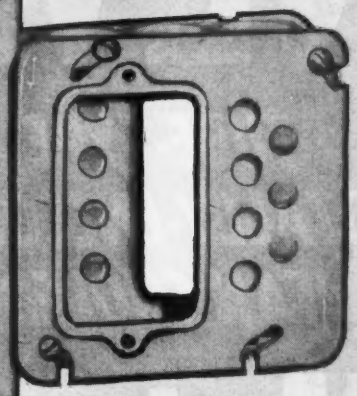
BLO-FAN INSTALLS OVER THE RANGE WHERE A FAN BELONGS—IN THE CEILING OR INSIDE WALL

PRYNE & CO., INC. BOX E • POMONA, CALIFORNIA

LOS ANGELES • SAN FRANCISCO • CHICAGO • NEW YORK

The 4" Square CONVENIENCE Shallow Wall Box (X-1¼)

HAS BEEN MADE *More* CONVENIENT

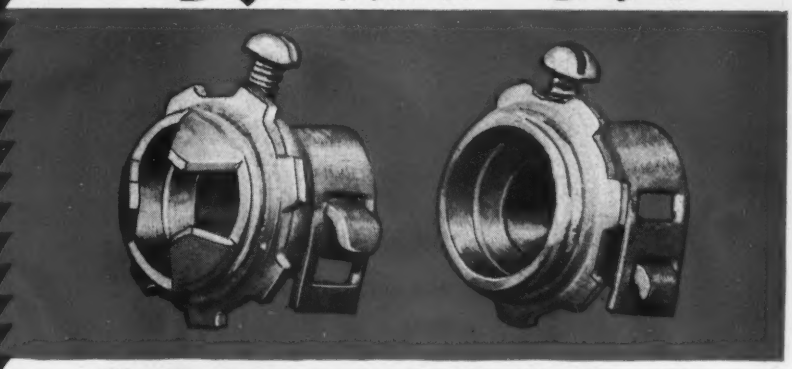


This box, designed for two covers, allowing for switches or receptacles to come in the same position on either side of the wall, is now provided with two screws—in tapped holes—for mounting on footed supports.

The 52-C-10 cover has been redesigned to provide additional space for use of two switches or receptacles. It also has slots for mounting on box—either vertically or horizontally—without removing screws.

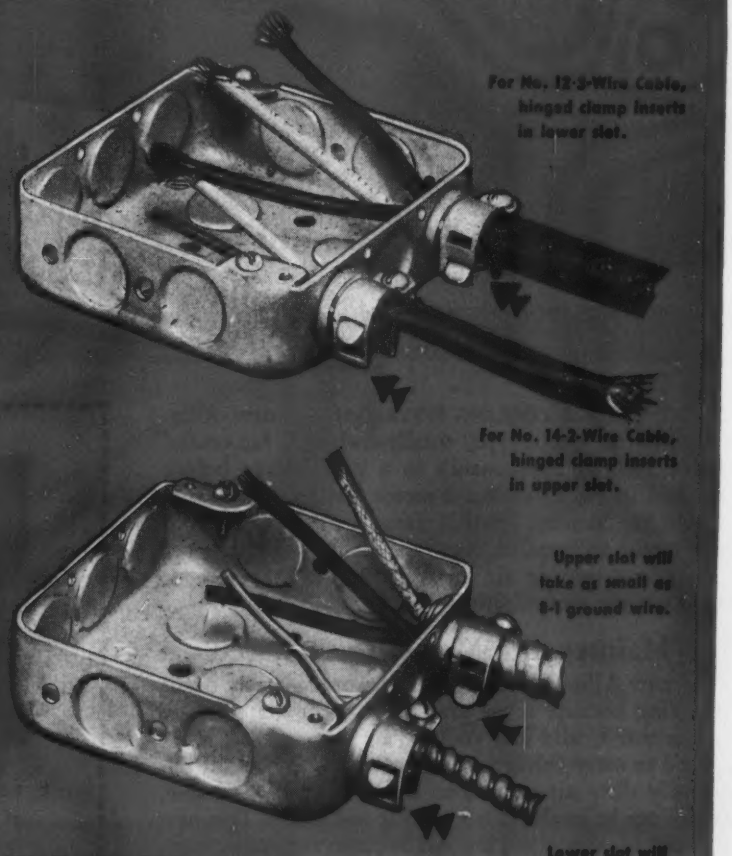
The footed box supports, in 20-inch and 31-inch lengths, can be nailed, screwed or welded to the studding. 8-inch slots in these supports allow for proper adjustment of box, which can be mounted without removing screws.

The New 591 *And* 592



CONNECTORS

For Metallic Sheathed Cable And Non-Metallic Sheathed Cable


For No. 12-3-Wire Cable, hinged clamp inserts in lower slot.
For No. 14-2-Wire Cable, hinged clamp inserts in upper slot.
Upper slot will take as small as 8-1 ground wire.
Lower slot will accommodate up to 12-3 Cable.

AVAILABLE FOR IMMEDIATE DELIVERY

STEEL CITY *Electric* CO.

1207 Columbus Ave. Pittsburgh 12, Pa.

STEEL CITY ELECTRIC CO. PITTSBURGH, PA. SIGN OF THE BEST GOODS CONDUIT FITTINGS SPECIALISTS.

NEW

TUBE-TYPE TOTALLY-ENCLOSED FAN-COOLED

Motors

Maintenance cut sharply on outdoor, corrosive and dirty installations 150 H. P. and up

THE UNIQUE COOLING SYSTEM of the new Allis-Chalmers tube-type, totally-enclosed, fan-cooled motor reduces maintenance to a point never before reached in totally-enclosed motor design. Tubes surround the stator. Internal fans circulate air within the motor to transfer heat to the tubes. An external fan moves outside air through the tubes to remove heat quickly and effectively.

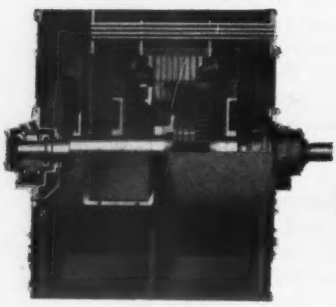
Maintenance Materially Reduced

The new Allis-Chalmers tube-type motor rarely needs cleaning because tubes are straight, the air passages unrestricted, and the cooling air flows at sufficient speed to carry foreign matter out with it. Should unusually dirty air conditions make cleaning desirable, tubes can be swabbed out quickly and easily. This new motor can be installed indoors or out in any atmosphere.

Cooling Efficiency Proved

Three years of successful field operation back up this new motor. For information, on how it can mean lower costs for you, contact your nearest A-C District Office or write for bulletins 51R7149 and 05B7150.

ALLIS-CHALMERS, 930A SO. 70 ST.
MILWAUKEE, WIS.



HOW TUBE-TYPE COOLING SYSTEM SAVES YOU MONEY ON MAINTENANCE

1. **LARGE HEAT TRANSFER AREA** of tubes plus efficient air flow removes heat quickly.
2. **STRAIGHT TUBES** do not normally clog or collect moisture and foreign matter.
3. **INTERNAL FANS** keep enclosed air constantly circulating, assuring even cooling and fast heat dispersal.
4. **EXTERNAL FAN** blows air through tubes to remove heat quickly and efficiently. Air speed keeps tubes clean.
5. **ALL ELECTRICAL PARTS ARE ENCLOSED:** Dirt cannot enter.

A-C ALLIS-CHALMERS

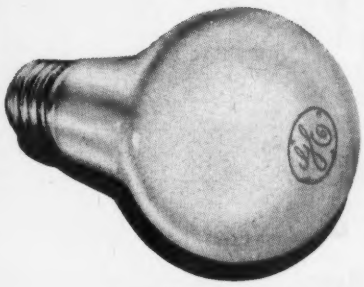
A 2647

ALLIS-CHALMERS

4 good ways to make a "sales call" pay off!

EVERY customer you call on uses lamp bulbs. And General Electric lamps are tops in preference with lamp users everywhere. So to pick up extra sales, just remind customers on every call that you carry G-E lamps and suggest that they stock up. Whatever lamps they need—popular types like these, or lamps for specialized uses—General Electric makes 'em all!

1



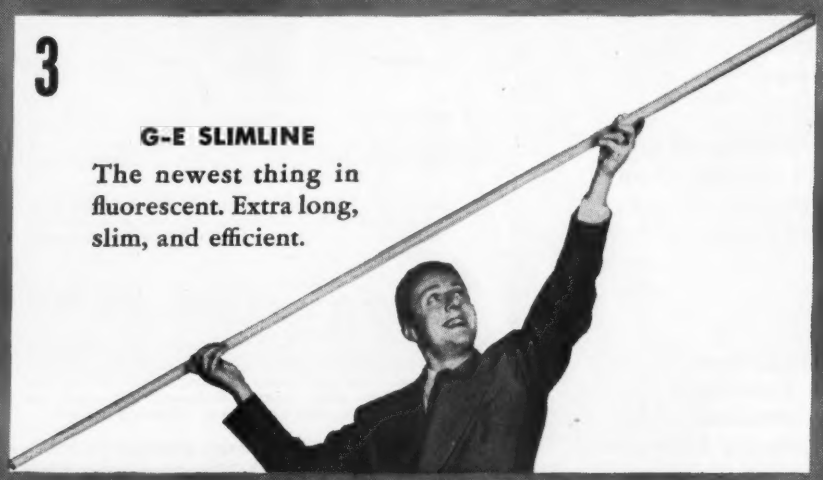
G-E FILAMENT
All types and wattages for many lighting needs.

2

G-E FLUORESCENT
Now available in five shades of white, plus standard colors.

3

G-E SLIMLINE
The newest thing in fluorescent. Extra long, slim, and efficient.



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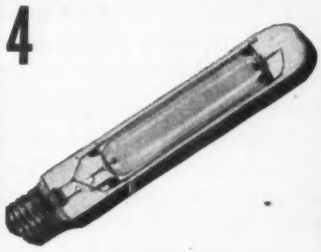


G-E MERCURY
Gives the most light for the money. A concentrated light source.

G-E LAMPS

GENERAL ELECTRIC

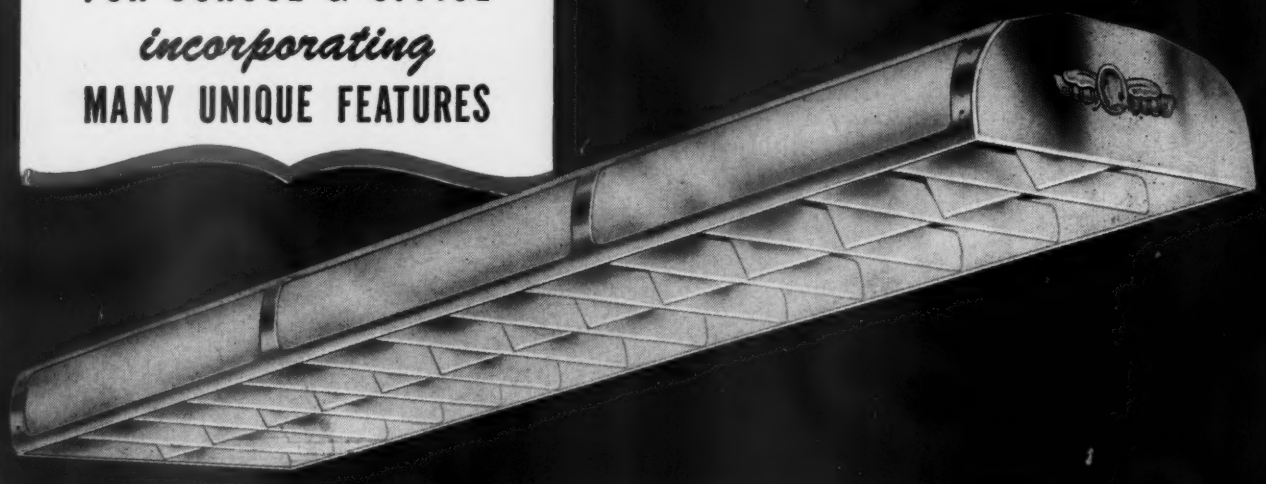
"Something Better Has Come to Light"

"The Monroe"

A-5000 SERIES*

FLUORESCENT LUMINAIRES

3 New UNITS FOR SCHOOL & OFFICE *incorporating* MANY UNIQUE FEATURES



THREE DISTINCTIVE PITTSBURGH PERMAFLECTOR FLUORESCENT LUMINAIRES combine maximum lumen output and minimum brightness ratios with economical initial cost and low installation cost.

All three "Monroe" Units give both downward and upward light distribution and have 35° crosswise and 25° lengthwise shielding. "Quick release" fittings allow hinging of the baffle-bottom from either side or complete assembly removal. Knockouts permit any type of installation. Adjustable hangers are available for individual or end-to-end pendant mounting.

"The Monroe" 2-Lamp Luminaires are typical of Pittsburgh Permaflector Quality Lighting Equipment designed for efficient performance, easy installation and simple maintenance. Pittsburgh Permaflector Fluorescent and Incandescent Equipment gives you a prestige and highly profitable "packaged" line that brings more customer satisfaction, quicker turnover and greater installation savings. Write today for details.

CONDENSED DATA ON "*The Monroe*"

A-5240-PL LUMINAIRE*—White translucent plastic side-panels are firmly secured in a one-piece, stamped steel, baked-on white enamel baffle-louvers and reflector. Efficiency —81%.

A-5240-AL LUMINAIRE*—Aluminum side-panels and transverse louvers distinguish this unit. Side-panels are longitudinally embossed for added appearance and strength. Efficiency —78%.

A-5240-ST LUMINAIRE*—Entire unit is 20 gauge sheet-steel. Transverse louvers and longitudinal reflectors are baked-on white enamel. Embossed side-panels are baked-on metallic silver-finish. Efficiency —83%.

Die-formed, metal parts assure precision fit, maximum rigidity and strength. One-piece construction with open bottom allows ready access to wiring channels from below when installing the luminaires. Medallion silhouettes of President Monroe, superimposed over cross-quills, add a decorative note to the ends and conceal knockouts used for continuous-runs.

For Full Details on "The Monroe"

Send for Advance Notice Sheet A-7. For information on other Fluorescent or Incandescent Equipment, request Catalogs 48 and 46 on your letterhead.

**Patent Pending*

Pittsburgh Reflector Company

404 OLIVER BUILDING • PITTSBURGH 22, PENNSYLVANIA

MANUFACTURERS OF FLUORESCENT & INCANDESCENT LIGHTING EQUIPMENT

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PITTSBURGH PERMAFLECTOR LIGHTING EQUIPMENT IS DISTRIBUTED BY BETTER ELECTRICAL WHOLESALERS EVERYWHERE

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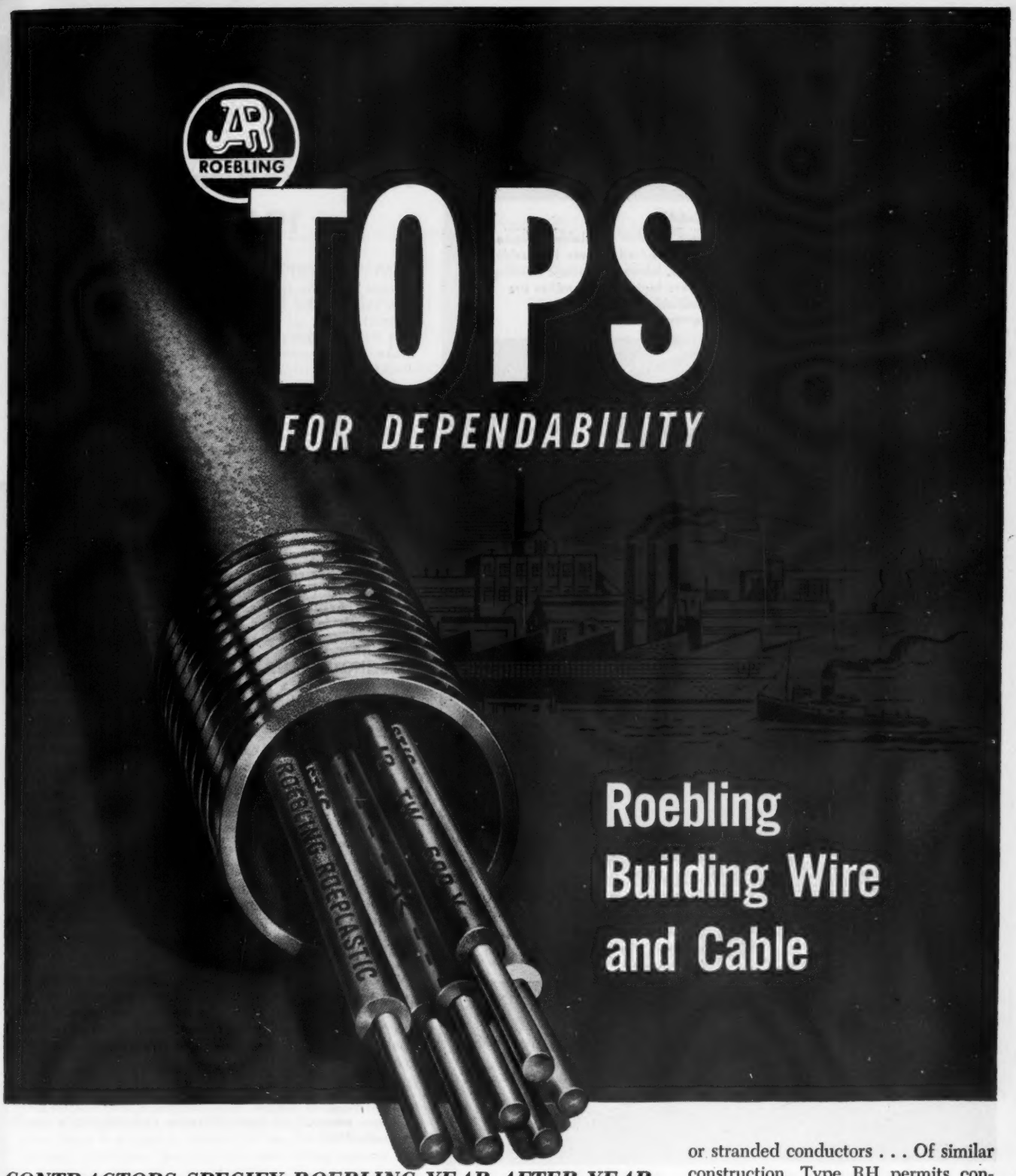
TOPS

FOR DEPENDABILITY



Roebling Building Wire and Cable

CONTRACTORS SPECIFY ROEBLING YEAR AFTER YEAR

EXPERIENCE IS THE BEST TEACHER, and it's actual experience that leads so many contractors to standardize on Roebling Building Wire and Cable. They know, from long use and service records, the supreme reliability and economy of Roebling wire and cable . . . make it their top specification.

For circuits to 600 volts and conductor operating temperatures to 60°C. (140°F.), Roebling Wire 60 Type R. is unsurpassed. It is synthetic rubber insulated; has a flame-and moisture-resistant fibrous covering; comes with solid or stranded conductors . . . Of similar construction, Type RH permits conductor operating temperatures to 75°C. (167°F.), and Type RW is adapted for wet locations without lead sheath.

There's a Roebling wire or cable for every requirement . . . call or write your nearby Roebling Distributor. John A. Roebling's Sons Company, Trenton 2, New Jersey.

WRITE OR CALL THE ROEBLING FIELD MAN AT YOUR NEAREST ROEBLING OFFICE AND WAREHOUSE

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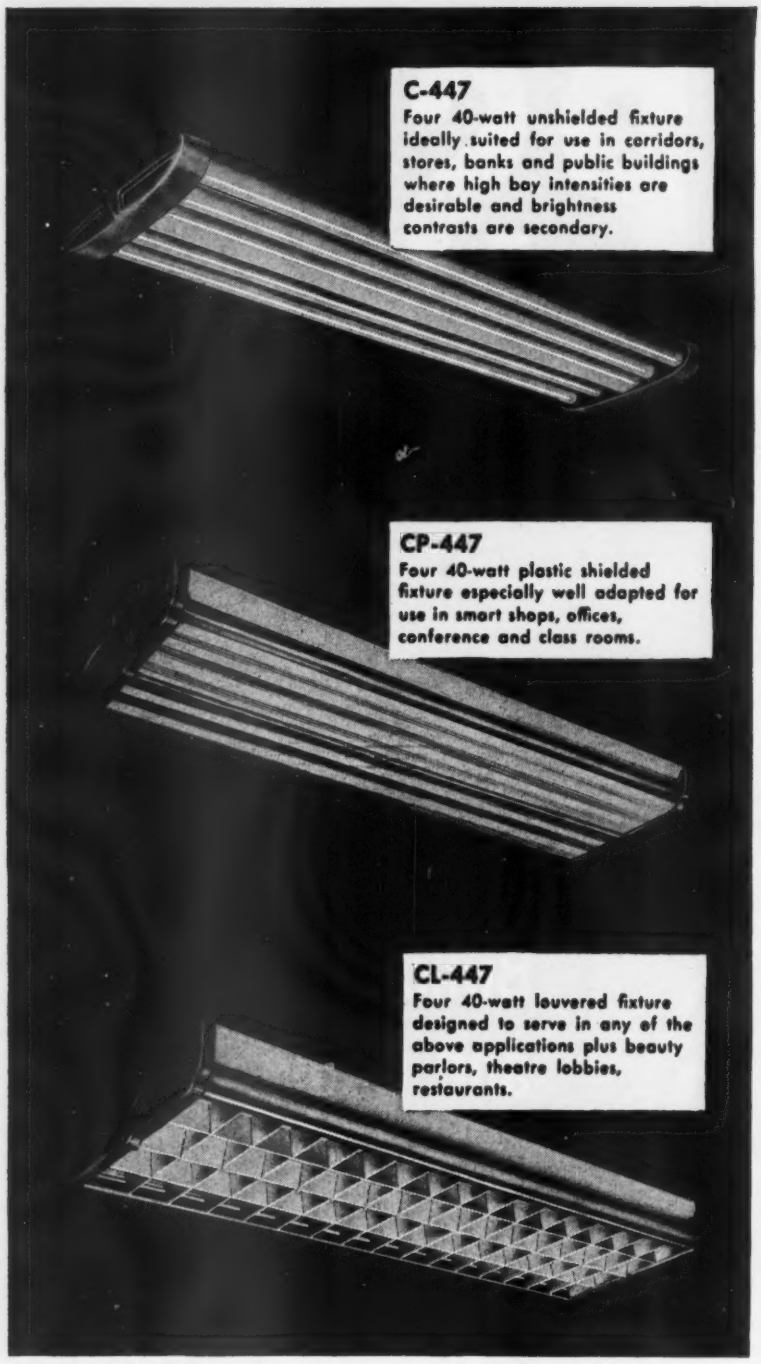
ROEBLING

☆ *A CENTURY OF CONFIDENCE* ☆

NOW! 3 NEW FOUR-LAMP FIXTURES TO


C-447
Four 40-watt unshielded fixture ideally suited for use in corridors, stores, banks and public buildings where high bay intensities are desirable and brightness contrasts are secondary.
CP-447
Four 40-watt plastic shielded fixture especially well adapted for use in smart shops, offices, conference and class rooms.
CL-447
Four 40-watt louvered fixture designed to serve in any of the above applications plus beauty parlors, theatre lobbies, restaurants.

These features will build 1949 sales

EASY TO INSTALL—These three new 4-lamp fluorescent units, designed to *match in styling and construction* the popular 2-lamp C-247 line, are just as easy to install! As in all Sylvania fixtures, special knockouts and wiring arrangements are carefully worked out to make your installation jobs the easiest and quickest ever known.

EASY TO MAINTAIN—No worry about nuts, bolts, or screws—none are required to hold shielding assemblies of the plastic shielded and louvered units . . . while the *basic chassis* fixture—the C-447—is so designed that lamps and starters can be readily replaced by a very simple removal of the end caps held in position by knurled thumb screws. Cleaning is especially simple since the one-piece top-housing and the reflector can be very readily dusted or washed with a minimum of effort.

INTERCHANGEABLE BASIC CHASSIS—The C-447 and C-247 are the *basic chassis* versions of the plastic shielded (CP-447, CP-247) and louvered (CL-447, CL-247) fixtures. From the basic chassis you can convert to these shielded models simply by ordering the proper conversion sets.

LUMINOUS SIDE SHIELDING—Luminous metal side shields are a feature of both the CL-447 and the CP-447. These shields pick up light directly from the enclosed lamps and reflect it from their white Miracoat finish. This eliminates glass and plastic along the sides, insuring greater rigidity of the shielding assembly as well as reducing the possibility of breakage.

ALL METAL CONSTRUCTION—All metal construction is an important factor for greater durability and long life. Sylvania fixtures are noted for their "new look" even after years of outstanding service.

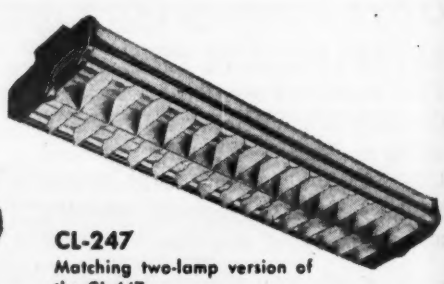
COMPLETE PACKAGES OF LIGHT—Complete packages of light means that these new fixtures come *complete, ready to install,* without fussing for lamps or starters. Your customers get the finest fixture housings equipped with the finest lamps, starters, lampholders, and ballasts!

MIRACOAT FINISH—Reflectors finished in Sylvania's easy-to-clean, Miracoat white, affording a reflection factor of not less than 86%. Chassis and end caps finished in Sylvania's high temperature, scuff-proof aluminum baking enamel to reduce brightness contrast with the ceiling.

ONE-YEAR GUARANTEE—Sylvania's one-year guarantee includes lamps, ballasts, and starters. This guarantee covers 25 or more fixtures ordered for a single installation.

C-247
Matching two-lamp version of the C-447.

CP-247
Matching two-lamp version of the CP-447.



CL-247
Matching two-lamp version of the CL-447.

FLUORESCENT LAMPS, FIXTURES, WIRING DEVICES; ELECTRIC LIGHT BULBS;

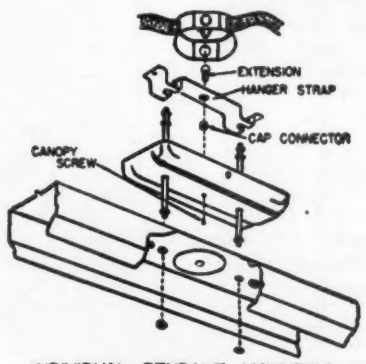
MATCH SYLVANIA'S C-247 TWO-LAMP UNITS

LOUVER SHIELDED CL-447 and PLASTIC SHIELDED CP-447

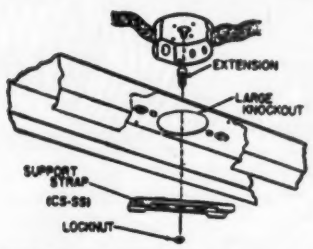
Controlled Lighting is built right into both these units. Through scientific designing, more light is directed in an upward direction than in a downward one, affording a greater diffusion of light with a minimum of harsh shadows and reduced brightness contrast between the fixtures and the ceiling.

Plastic shielding of this attractive fixture is *extruded* and carefully chosen for its dimensional stability and resistance to distortion as opposed to the ordinary bent type of plastics. The shielding is designed for a maximum uniformity of diffusion without a corresponding sacrifice in transmission of light!

All are easy to install!



INDIVIDUAL PENDANT MOUNTING



INDIVIDUAL SURFACE MOUNTING

One of the most important things for you to consider is the ease with which you can install these fixtures. Our engineers have made it a point to design this line for the easiest and quickest installation. The exploded views above indicate this.

For continuous row mounting special joining mounting plates are furnished with a center knock-out which permits suspension of joining fixtures with a single stem at the central point between the units. By means of a wire-way connector which is furnished with this joining assembly, primary wiring may be brought down one of the stems at any point in a continuous row installation.

This method of single stem mounting eliminates unnecessary and unsightly dual stems at the suspension points and likewise brings the suspension point where it should be, between the fixtures. In pendant mounted continuous rows an additional stem is installed for the first and last fixtures at the end of each row.

UNSHIELDED C-447

Interchangeability of fixtures from an unshielded to either a plastic shielded or louvered fixture makes this complete Sylvania line one of the most versatile ever designed. No matter what your customers ask for in fluorescent fixture lighting, you can draw on this flexibility of Sylvania's C-247 and C-447 basic fixture line to meet any requirement!

SYLVANIA ELECTRIC

Sylvania Electric Products Inc.
Advertising Dept. L-6004
500 Fifth Ave., New York 18, N. Y.

Gentlemen: Send full details on new C-447 line (Engineering Bulletin 0-75).

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Address.....

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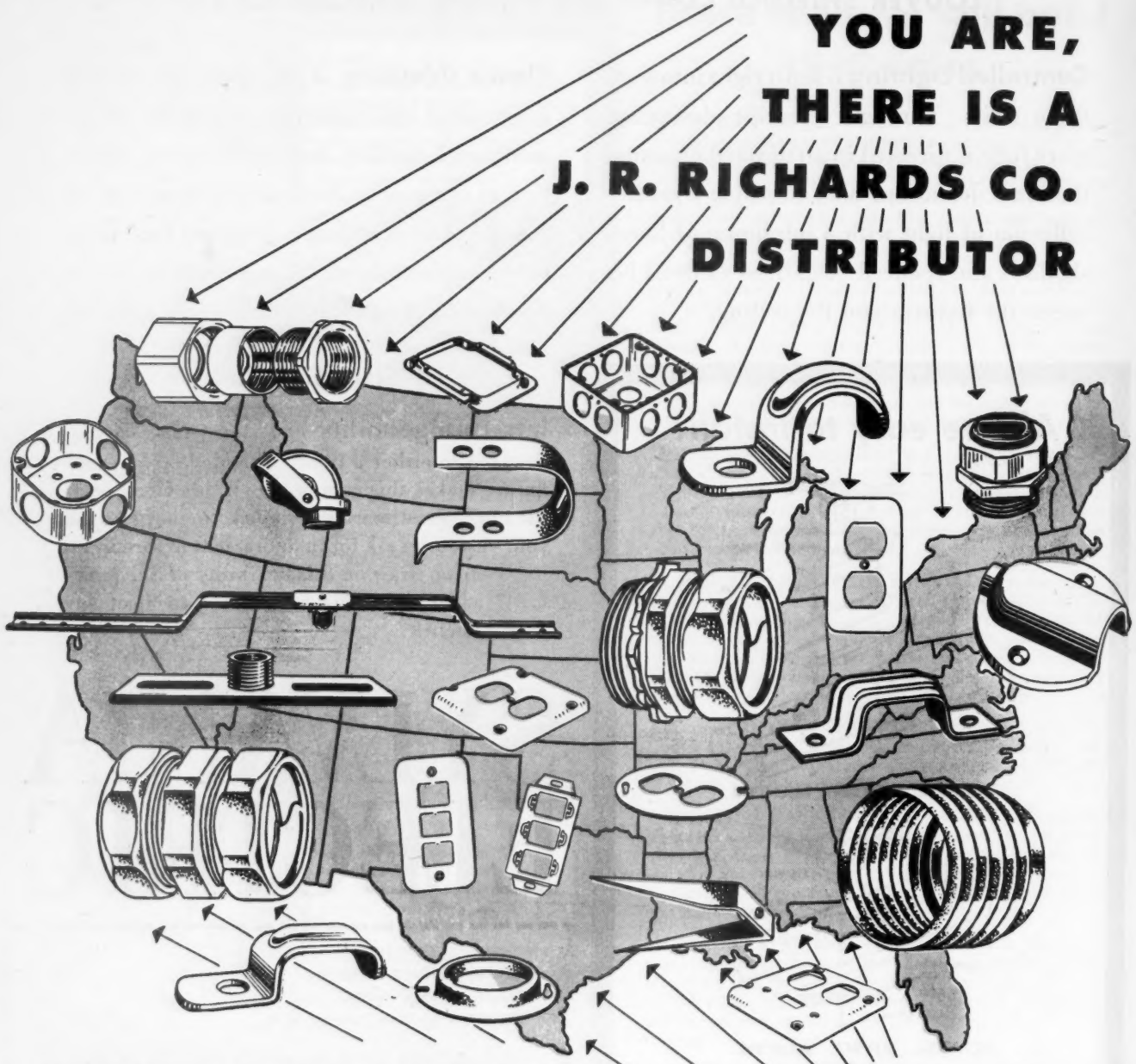
State.....

MAIL COUPON TODAY!

PHOTOLAMPS; RADIO TUBES; CATHODE RAY TUBES; ELECTRONIC DEVICES

– Quality Fittings for Every Electrical Job

WHEREVER YOU ARE, THERE IS A J. R. RICHARDS CO. DISTRIBUTOR



READY TO SERVE YOU

J. R. Richards Company distributors, with a complete line of Richards' electrical outlet and switch boxes, covers, fittings and specialties, are as close to you as your 'phone! Centrally located sales representatives assure you of fast, reliable cooperation, and an EXPERIENCED organization assures the kind of forward-thinking distribution and supply that will help you keep your stock and facilities up to date. Progressive, modern ideas, along with a new streamlined manufacturing plant, assures you of quality, latest designs, quicker installation at lower costs.

Write today for copies of our new bulletins and ask for the name of your local Richards' distributor.

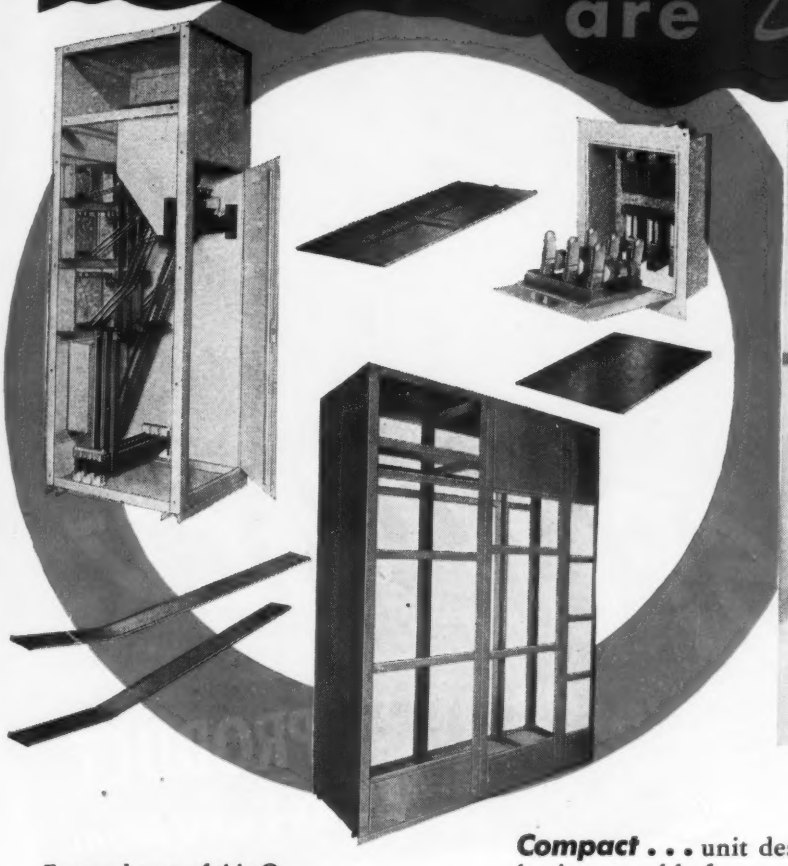
THE J. R. RICHARDS COMPANY

CARNEGIE PENNSYLVANIA

a lot of reasons why

FA SWITCHBOARDS

are *Dependable!*



Featured part of this FA Switchboard is the safety-type FA Klampswitchfuz which combines both disconnect switch and fuse protection in one unit . . . for more perfect contact and safer maintenance. Heavily electro silver-plated, copper contacts are "squeezed" together in one locking motion that clamps fuses at the same time, for 30 to 200 amps; for more than 200 amps., FA KAMKLAMP pressure-type fuseholders are used. Access to fuses only when door is open . . . prevents contact with live parts.

Capacities: 30 to 1200 amps., 250 volts, AC or DC; and 30 to 400 amps., 575 volts, AC, in 2, 3 and 4 poles.

Compact . . . unit design, welded construction to provide long-lasting, trouble-free service.

Flexible . . . assembled and shipped ready for connection of main and branch circuit cables . . . units can be arranged singly or grouped . . . sections readily fit together . . . removable end walls permit adding sections to either side.

Tailored for your needs . . . the number and capacity of FA Klampswitchfuz switches are provided *as specified by you.*

Safer Operation . . . dead front, completely enclosed, with fuses accessible only when switch door is open.

More efficient . . . less maintenance required . . . ample capacity . . . modern design . . .

Add these reasons together and you will find that YOUR sum total checks with ours . . . DEPENDABILITY.

There are many other reasons why the FA Klampswitchfuz Switchboard is dependable, so contact your FA Representative for details.

FA TRADE MARK

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Makers of BUSDUCT • PANELBOARDS • SWITCHBOARDS • SERVICE EQUIPMENT • SAFETY SWITCHES • LOAD CENTERS • QUIKHETER

TRANSFORMED

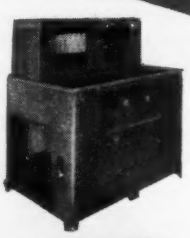
...PRINT to PRODUCT by Kirk and Blum

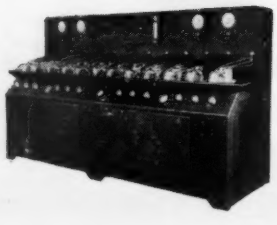
THERE'S no magic wand in the act—KIRK & BLUM transforms your prints into accurate, finished product, part or sub-assembly. Standard and special machinery, operated by skilled metal workers under trained supervisors account for the satisfaction expressed by thousands of plants who use KIRK & BLUM'S sheet metal fabricating service.

Illustrated at top is one of many switch gear housings which Kirk & Blum build for large power projects. Some of these are constructed entirely of aluminum plate and others of steel plate with phase barriers of asbestos cement sheets. At right are shown a few of the varied electrical enclosures made by Kirk & Blum.

Whether you are interested in one part . . . or a thousand . . . KIRK & BLUM will gladly quote from your prints and specifications. No obligations, of course. A revised edition of "Sheet Metal Assemblies," showing typical work and listing facilities and capacities, is yours for the asking.

Contract Manufacturers in all sheet metals and light structurals.





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CONTROL BOARDS • PANEL BOARDS • GAUGE BOARDS • CONTROL DESKS • DISTRIBUTION PANELS • SWITCHBOARDS • METAL ENCLOSURES • CONNECTION BOXES • SWITCH GEAR HOUSINGS • CUBICLES

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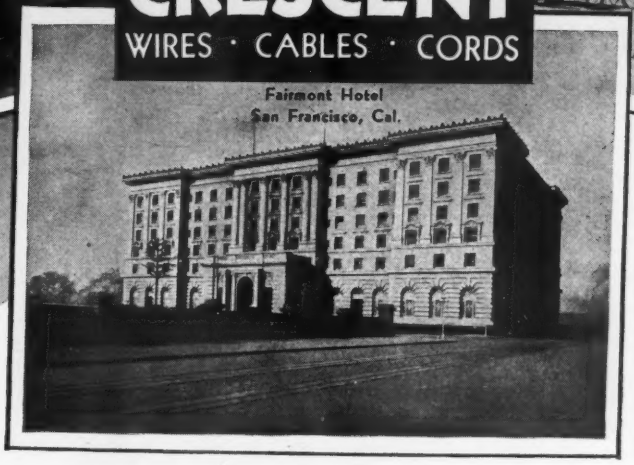

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The existing buildings shown above as they appeared in our catalog printed over forty years ago, were wired with CRESCENT, which has given dependable service through the years.

From coast to coast for over sixty years CRESCENT Wire has been a first choice of architects, engineers and electrical contractors for outstanding building jobs.

CRESCENT INSULATED WIRE & CABLE CO.

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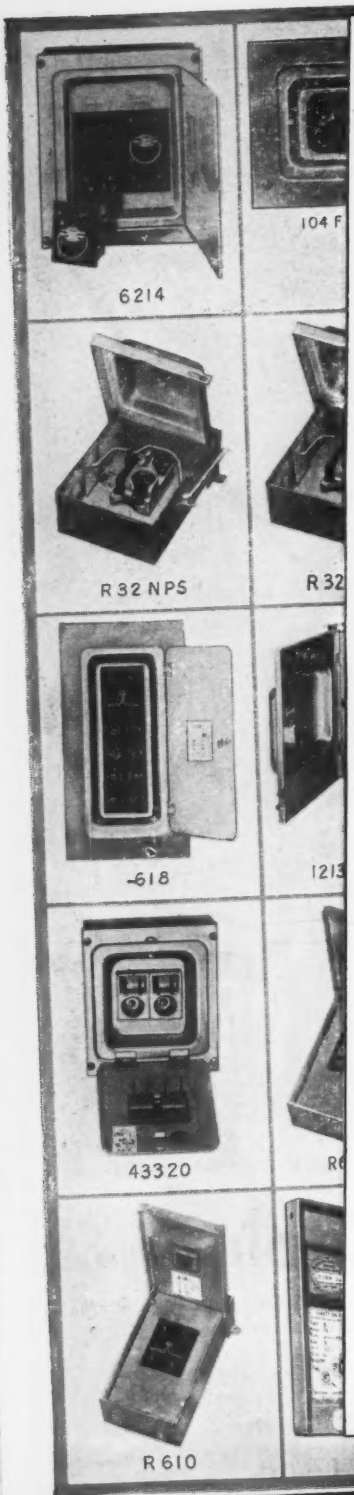

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General Switch Corporation are specialists in the design, engineering, and production of Enclosed Safety Switches, Service Entrance Equipment, Branch-Circuit or Residence Panels, Panelboards for Light and Power Distribution.

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- ★ GREATER CONVENIENCE
- ★ BETTER APPEARANCE
- ★ TROUBLE-FREE PERFORMANCE

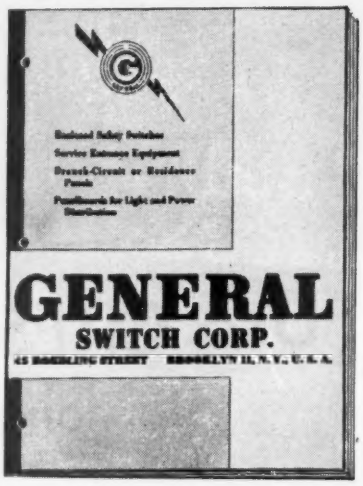
Easy to install • Easy to service

Send for the latest GENERAL catalog, complete with illustrations, specifications, mounting dimensions, selection tables, wiring data, knockout layouts, and a cross index of comparative catalog numbers.

Copies sent free on request.

More and more Contractors and Wholesalers are switching to

GENERAL



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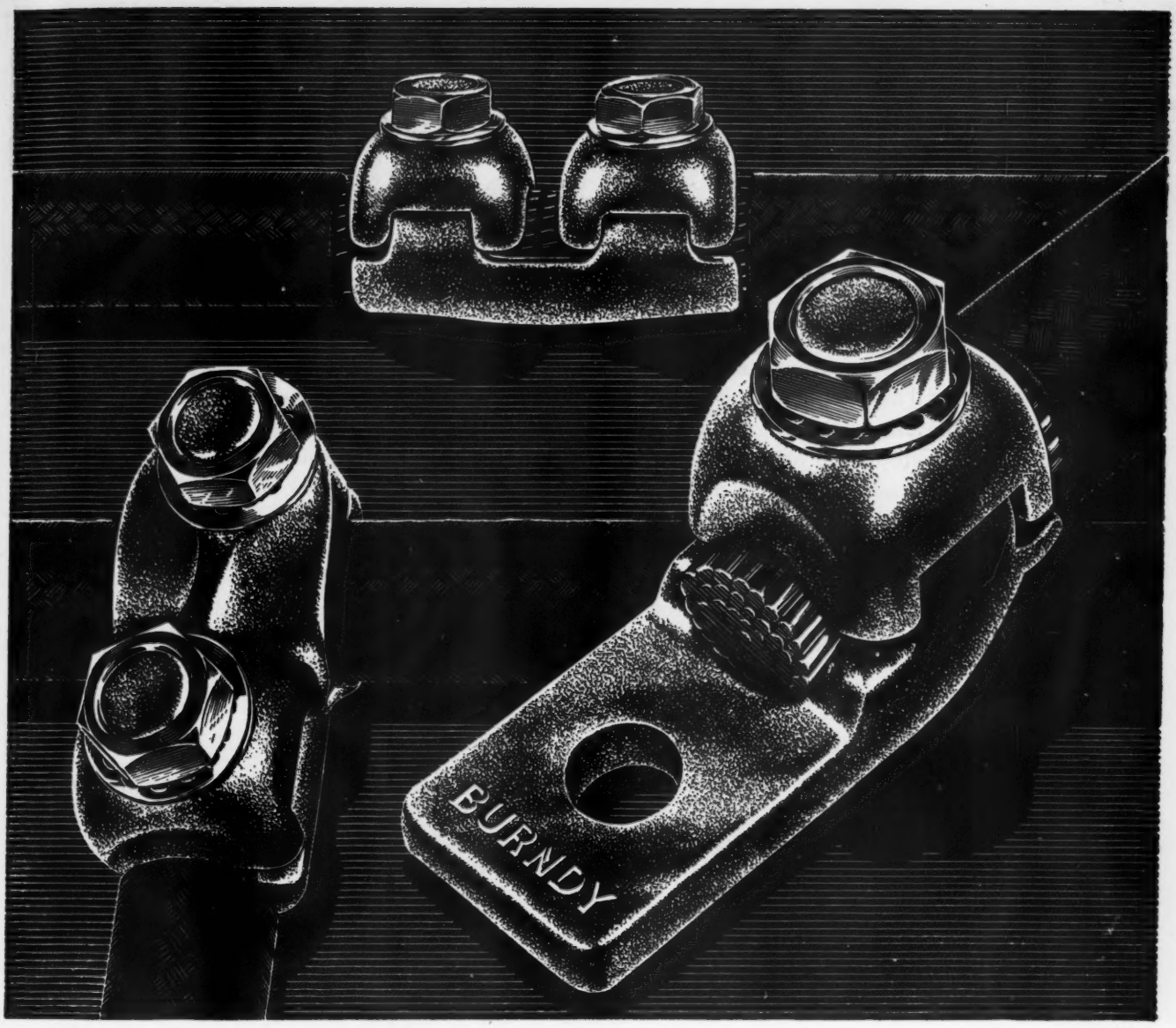

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. . . a family of connectors designed for quick, high strength connections—including QIKLUG, QIKLINK, and QIKTAP illustrated; as well as many variations for special applications. Unit assembly of the lug and link permits connecting without taking apart . . . each connector accommodates a range of sizes. Compactness and rounded edges make taping easy. Installed with ordinary wrench. Available for conductors from #14 Sol. to 2000 Mcm. Ask for catalog describing the complete Qik-line, and showing why it pays to

Connect with

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WESTERN BRANCH: Vernon 11, California • CANADA: Canadian Line Materials, Ltd., Toronto 13

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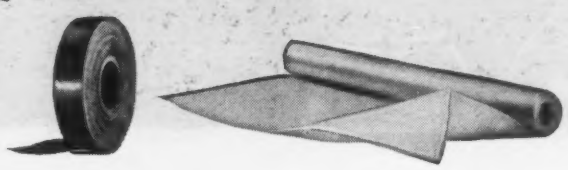
5 FACTS YOU SHOULD KNOW ABOUT THESE



VARNISHED CLOTH AND TAPE

1 WHAT THEY ARE

Fabrics woven of Fiberglas Continuous-Filament Yarns are impregnated and coated with high-quality varnishes to meet the increasing demand for a strong, flexible cloth or tape insulation having outstanding dielectric strength, excellent resistance to heat, moisture and acids, plus dimensional stability. All the inherent characteristics of an inorganic material are incorporated in the base fabric. Properly impregnated, it provides heat resistance, high thermal conductivity and insurance against the effects of overload.

2 WHERE THEY ARE USED

Varnished Cloth and Tape made of Fiberglas Yarn are used as transformer sheet insulation, coil and bus bar insulation, slot and end winding, phase insulation, cable wraps, etc. They are ideally suited for applications requiring heat resistance, high mechanical and dielectric strength, resistance to the effects of acids, oils and moisture . . . wherever greater protection against insulation failure is desired.

3 FORMS AVAILABLE

They are available in finished thicknesses of .003″ through .030″ in both sheet and tape form. Standard rolls of sheet material are supplied in 25, 50 or 100 lineal yards, 36″ wide. Standard tape rolls are 36 and 72 yards long in widths up to 6″ . . . bias cut tapes available in 51″ long strips. Black or yellow varnish.

SLEEVING AND TUBING

1 WHAT THEY ARE

Saturated Sleeving and Varnished Tubing are made of Fiberglas Continuous-Filament Yarns, tightly braided and then saturated or coated with high-quality electrical varnishes to exceed minimum ASTM and the Varnished Tubing Association specifications for dielectric strength and heat endurance. Unusual flexibility, chemical resistance, mechanical strength and electrical properties are retained over wide temperature ranges to meet every application.

2 WHERE THEY ARE USED

Sleeving and Tubing made of Fiberglas Yarn are used as coil and terminal insulation, in appliance wiring and coil-end insulation, phase connections —wherever a dependable, durable insulation is required.

3 FORMS AVAILABLE

Sleeving and Tubing are available in all of the standard grades, sizes and colors established by the ASTM and VTA. Colors: brown, black, red, green, yellow, blue, white. Standard lengths: Varnished—36 to 42-inch lengths; Saturated—36 to 42-inch cut lengths or in coils, depending on grades and sizes . . . several degrees of flexibility.

4 WHO MAKES THEM

Varnished Cloth and Tape, Saturated Sleeving and Varnished Tubing, made of Fiberglas Yarn, are produced by the leading manufacturers of electrical insulating materials.

5 WHO SELLS THEM

These products are sold by the manufacturers' electrical distributors and representatives. If you are unable to locate a supplier, call or write the Owens-Corning Fiberglas Corporation branch in your vicinity.

These products are but a few of the many available forms of Fiberglas-base Electrical Insulating Materials. A copy of "Fiberglas Electrical Insulating Materials" manual containing information on the complete line will be sent on request . . . Owens-Corning Fiberglas Corporation, Dept. 856, Toledo, Ohio.

YARNS FOR USE IN: CORD • TAPE • BRAIDED SLEEVING • CLOTH • LAMINATES

FIBERGLAS-BASE ELECTRICAL INSULATING MATERIALS

FIBERGLAS-BASE LAMINATES

These are materials possessing a desirable combination of insulating and mechanical properties produced by applying heat and pressure to layers of glass cloth or mat impregnated with, and bonded by, appropriate resins.

Phenolic Laminates. Mat and Cloth, made of Fiberglas Yarn, impregnated with phenolic resins . . . offer good physical properties, low moisture absorption and high dielectric strength . . . can be machined and punched.

Melamine Laminates. Glass Cloth impregnated with melamine resins . . . possesses high arc resistance, good dielectric strength with low moisture absorption . . . can be machined and punched.

Silicone Laminates. Glass Cloth and Mat impregnated with silicone, a thermosetting resin having very high heat stability . . . contribute to low dielectric loss factor and low moisture absorption.

Polyester Laminates. Mat and Cloth made of Fiberglas Yarn, impregnated with thermosetting polyester resins . . . good temperature resistance, electrical and mechanical properties . . . complex shapes possible with low-cost tooling . . . excellent machining and punching properties.

Fiberglas-base Laminates are used for panelboards, slot sticks, transformer spacers, switch bases, terminal strips and boards, insulating washers, coil forms, pole collars, arc shields, etc.

Phenolic Laminates. Used wherever above-average tensile, flexural, compressive and impact strengths combined with good electrical properties are required.

Melamine Laminates. Used where fire, arc and temperature resistance, and high impact strengths are important.

Silicone Laminates. Used in electrical apparatus where ambient or operating temperatures are excessively high and moisture conditions are severe.

Polyester Laminates. Used where above-average temperature resistance and physical properties are required . . . as an excellent general-application laminate material.

Phenolic: Sheets 36″ wide to 96″ long. Up to 2″ thick.
Tubes up to 6″ I. D. in 18″, 36″ or special lengths.
Rods up to 2″ diameter. Up to 36″ lengths.
Melamine: Sheets 36″ wide to 96″ long. Up to 2″ thick.
Tubes up to 1½″ diameter.
Rods up to 4″ diameter.
Silicone: Sheets 36″ to 46″. Up to 1″ thick.
Polyester: Sheets up to 36″ x 60″. $\frac{1}{32}$″ to 1″ thick. Special shapes possible.

FIBERGLAS-MICA COMBINATION PRODUCTS

Fiberglas-Mica Combination Products are made by bonding layers of mica films on, or between glass cloth, or between glass cloth and paper, with either an organic or high heat-resistant (silicone) binder. This combination of Fiberglas fibers—with their great tensile strength and ability to withstand the effects of high temperatures and moisture—and inorganic, high dielectric mica, makes an ideal Class B insulating material. These Fiberglas-Mica Combination Products conform to the standards of the National Electrical Manufacturers Association on built-up mica flexible sheets and tapes.

Fiberglas-Mica Combination Products are used as ground or slot insulations in motors and generators, phase insulations, transformer coil insulations, coil wrapping tapes, end insulations, cable splices—wherever mechanical and electrical requirements are severe and the maximum safety factor is desired.

Mica combinations are available, with organic binder, in thicknesses from 5 to 35 mils. Special thicknesses can be provided on order. The glass cloth may be applied on both sides—facing thicknesses can be varied. Thinner products, in tape form, are sometimes made with very thin paper on one side and glass cloth on the other face. With silicone binder, the thickness ranges from 4 to 12 mils. Both types available in standard sheets 36″ square and in standard tapes.

Fiberglas-Base Laminates and Fiberglas-Mica Combination Products are made by leading manufacturers of electrical insulating materials.

*FIBERGLAS is the trade-mark (Reg. U. S. Pat. Off.) of Owens-Corning Fiberglas Corporation for a variety of products made of or with glass fibers.

OWENS-CORNING
FIBERGLAS
ELECTRICAL INSULATING MATERIALS

VARNISHED CLOTH • SATURATED TUBING • MAGNET AND LEAD WIRE • MICA COMBINATIONS

TTR TEST SET

Here is a portable, simple-to-use and highly accurate device for measuring turn ratio in power and distribution transformers, including auto-transformers.

With the "T T R" Set you can—

- Measure the turn ratio of new, repaired and rewound units.
- Check polarity.
- Quickly identify leads and taps.
- Check tap-changer settings.
- Investigate load division and circulating current between units or banks.
- Detect shorted or missing turns.
- Locate concealed faults.

The "T T R" Set is an invaluable tool in transformer work . . . checking new units at time of trouble . . . during and after repairs. It consists essentially of a reference transformer, adjustable in ratio from zero to 130, in parallel with the transformer under test. The result is read directly from the position of four dial switches adjusted to null balance.

The "T T R" Set is operated by one man and is suitable for both shop and field use. It is completely self-contained, including an 8-volt hand generator, test leads and clamps. No other equipment is necessary.

For more complete, detailed information we invite you to write for Bulletin 55-EC.

JAMES G. BIDDLE CO.

Electrical & Scientific Instruments

1316 ARCH STREET, PHILADELPHIA 7, PA.

Frictionless as Flight!

Only Federal Noark Motor Starters have free action . . . the one moving unit floats on ball bearings

YOU DON'T SEE the ball bearings, but push up that moving unit and you *know* they're there. Only a featherlight touch is needed! And only Federal Noark Motor Starters give you that floating ball bearing action—with consequent longer and trouble-free service life.

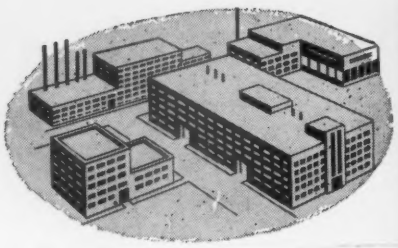
But chalk up too, these additional advantages of Federal Starters! Their overload relays allow you the choice of automatic or manual reset by merely turning a knob. Coils are replaced in a matter of seconds. All parts are readily accessible from the front.

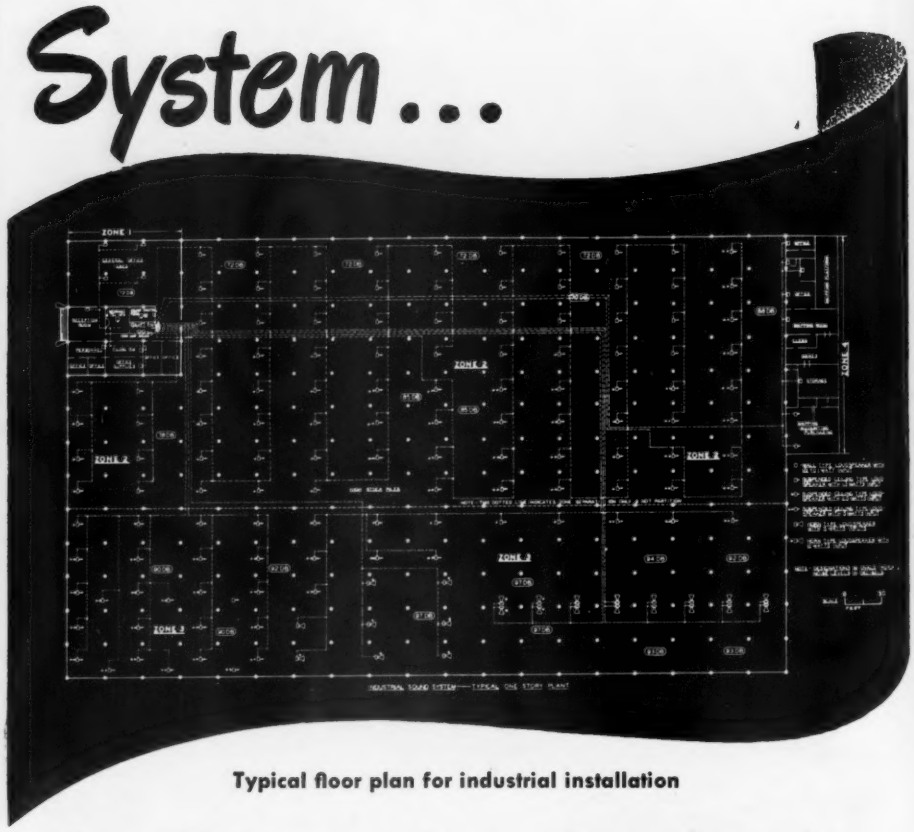
Order Federal Noark Motor Starters from your Federal Distributor and save time, effort and money. And write us for free copies of the "Federalog" and "Simplified Motor Control" giving full descriptions. Federal Electric Products Company, 50 Paris St., Newark 5, N. J.

FEDERAL NOARK
MOTOR STARTERS

Complete line of Federal Electric Products includes Motor Controls, Safety Switches, Service Equipment, Circuit Breakers, Panelboards, Switchboards, Control Centers, Bus Duct ★ Sales offices in principal cities.

It's Easy to Install a Sound System...





Typical floor plan for industrial installation

—with time-saving RCA Engineering Service

YOU'LL FIND SOUND SYSTEMS easy to install when they are engineered by RCA. All units of an RCA Sound System are designed for easiest possible mounting. You'll save time because RCA Sound System layouts and specifications are easy to follow.

You gain a good reputation when your clients are enthusiastic with the results of your installations. You generate this kind of enthusiasm when you recommend or install an RCA Sound System. That's because these sound systems are engineered to the requirements of your client's organization.

There is no ready-made "package" sound system that perfectly suits the noise level, type of buildings, needs of various types of plant and office layouts. Working with your nearest RCA Sound Products Distributor, you provide your clients with sound systems that give them the most for their money.

No matter what size or type of sound system you are asked to bid on, RCA can help you plan and engineer a system that will best fit your customer's requirements.

Contact your nearest RCA Sound Products Distributor or write: Sound Products (Dept. 118-D), Radio Corporation of America, Camden, New Jersey.

-------- Let RCA Help You Plan and Engineer Sound Systems For --------

OFFICE BUILDINGS
SCHOOLS
CHURCHES
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INDUSTRIAL BUILDINGS
HOTELS
INSTITUTIONS
DEPARTMENT STORES
TRANSPORTATION TERMINALS
RECREATIONAL CENTERS
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DO YOU HAVE A COPY?

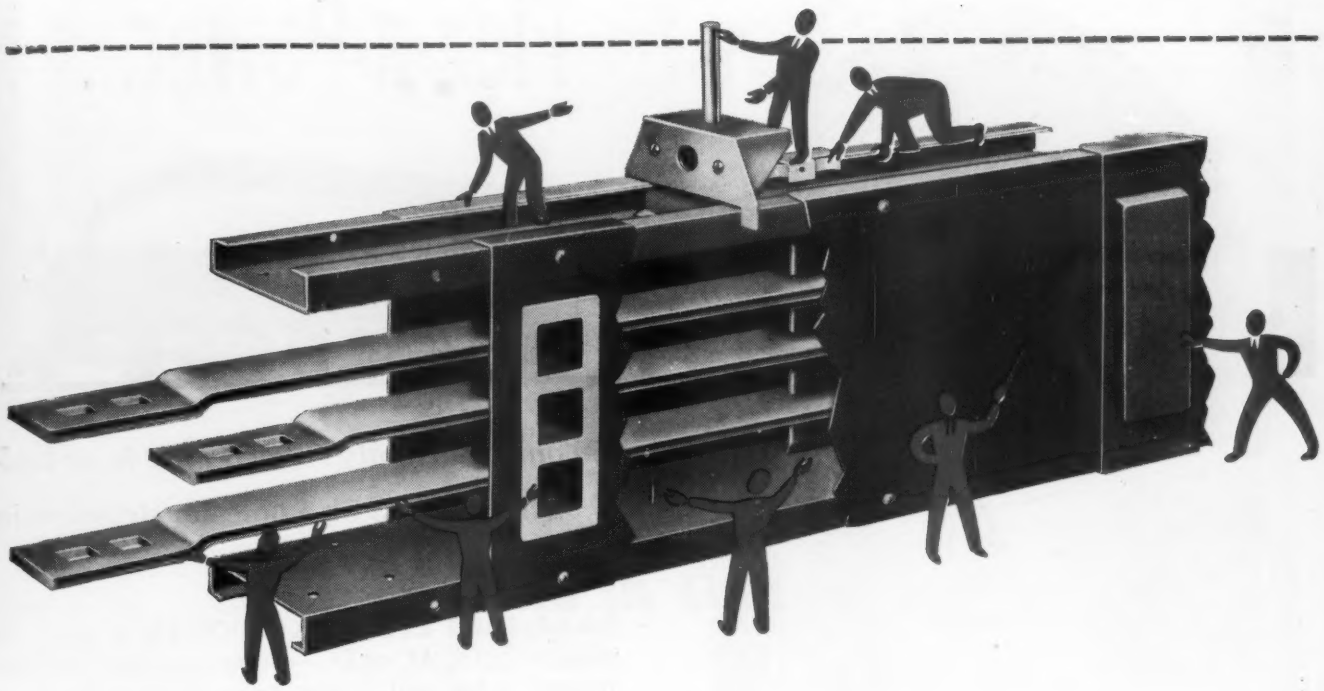
The Architect's Manual of Engineered Sound Systems. The most authoritative work book and reference manual published on sound systems. Typical plans, and specifications for all types of buildings. 288 pages. Price $5.00 ($5.50 foreign).

SOUND PRODUCTS
RADIO CORPORATION of AMERICA
ENGINEERING PRODUCTS DEPARTMENT, CAMDEN, N.J.

In Canada: RCA VICTOR Company Limited, Montreal

YOU CAN BE **SURE**.. IF IT'S

Westinghouse



This current carrier has a *long future*

Look inside—and outside—of Westinghouse Bus Duct and you'll spot features that contribute to more efficient power distribution. More important, you'll see features that promise to maintain this efficiency almost indefinitely. Here are two standout examples:

1. **A Bonderized Housing**—an exclusive feature that protects the structure against rust and corrosion . . . assures better paint adhesion . . . adds extra years to service life.

2. **Prestite Insulation**—another Westinghouse exclusive—is used to insulate and support bus bars and provide safe plug-in openings. Prestite has exceptional dielectric qualities, great mechanical strength . . . is impervious to moisture.

And here are other features which assure important service benefits:

Plug-ins every 12 inches on alternate side of duct.
Sliding covers over plug-in openings to facilitate access . . . inspection.
External springs hold outlet covers in position at any point along duct.
Simple, strong cantilever hanger . . . easy to align.
Rigid channel construction . . . top, sides and bottom.
Heavily silver-plated bus joints assure good contact.

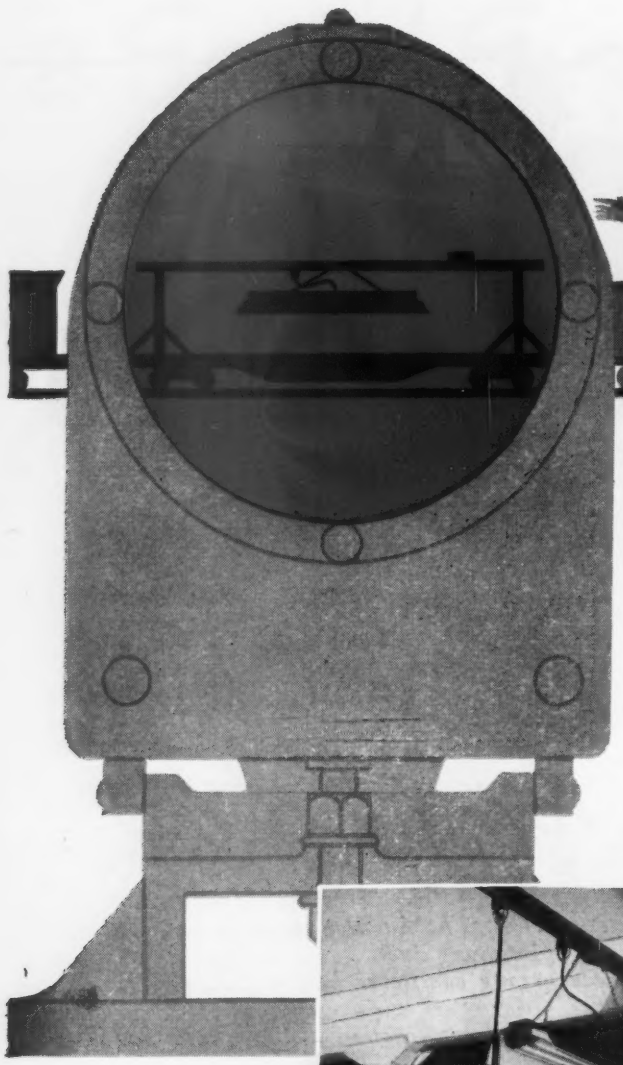
Booklet B-4271 contains complete facts about bus duct. Ask your Westinghouse representative for a copy, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

J-60707

Westinghouse

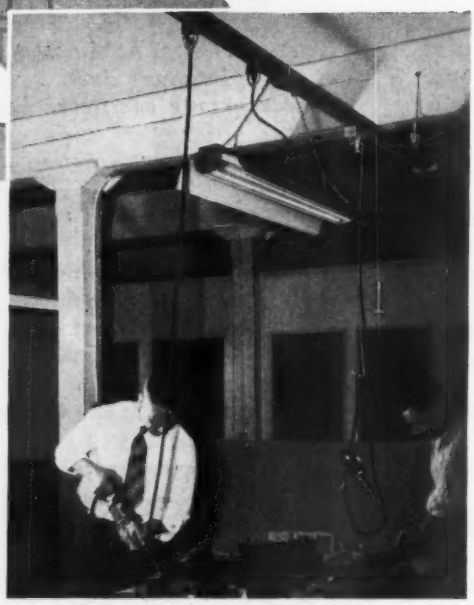
Bus Duct

You get 6 big advantages with New LTG Flex-a-Power...



The only unusually rugged plug-in or trolley busway in 2, 3 or 4 pole construction in one compact housing.

Pre-fabricated LTG FLEX-A-POWER — rated 50 amps — 250 v, AC or DC — supplies power for fluorescent lights and power tools. It provides both trolley power take-off and a continuous outlet — you can tap at any point . . . ideal for industrial plants, offices, stores, arenas, work shops and garages. Here are more new features:



1. **EASY TO INSTALL** — simplified hanging and joining methods speed up installation.
2. **IT'S ECONOMICAL** — two or more circuits can be run in one housing — controlled separately.
3. **PERMITS BALANCED LOADS** — plugs or trolleys are polarized which provides a convenient means of balancing loads.
4. **IT'S REALLY RUGGED** — rigid construction of housing itself prevents sagging — only 2 hangers needed for each 10 ft. section.
5. **MORE FLEXIBILITY** — standard fittings such as elbows and radius sections permit economical custom installations — easy to disassemble and relocate.
6. **GREATER CONVENIENCE** — trolley with silver alloy contacts may be inserted or removed at any point along the run — no "drop-out" section required.

FOR MORE INFORMATION, write for circular TEC-3, THE TRUMBULL ELECTRIC MANUFACTURING COMPANY, Plainville, Conn.

Men Who Observe the Best Electrical Practice Make It a Practice to Use

TRUMBULL (T) ELECTRIC

TRUMBULL'S TRAINLOAD OF NEW PRODUCTS

No. V-1720
Etched glass with ivory trim and clear bands. Hugs ceiling. 20-inch spread.
No. V-1920
Ivory tinted glass with colonial brass gallery and brass accent trim. Delicate doily design on clear glass center.
VIRDEN VALUE
Ceiling Units in Glass...
by Virden
No. J-514
Sparkling crystal highlight design with canary yellow, rose, blue or French crystal background. 14-inch spread.
No. J-411
Softly tinted ceramic finish with sparkling clear highlights. In rose, blue, French crystal or canary yellow.

for living room • dining room • bedroom

Sheer loveliness in glass! This group of Virden units with its soft colors . . . graceful shapes . . . subtly etched decoration . . . and sparkling elegance . . . fits a wide variety of interiors. Clean, modern lines, plus a traditional touch that has real customer appeal. Top that with Virden value . . . based on Virden mass production "know-how" . . . and you've got a lively combination for more sales. Ask your Virden wholesaler!

John C. Virden Company • Cleveland, Ohio

Member American Home Lighting Institute

NEVER BEFORE!

A G-E General-Purpose* Insulating Varnish

WITH THESE OUTSTANDING CHARACTERISTICS

G.E.'s new 9574

☑ EXCELLENT BONDING STRENGTH

General-purpose 9574 has excellent bonding properties. It is ideal for all types of motor windings (except extra high-speed armatures), and has outstanding electrical characteristics.

☑ EASIER TO WORK

G-E 9574 is a phenolic drying-oil varnish. It's particularly easy to use and handle. It has an unusually high flash point (100 F), and its viscosity (250 C. P. average at 45 F) makes it usable at barrel gravity.

☑ NO SPECIAL THINNERS REQUIRED

G-E 9574 can be thinned with ordinary petroleum spirits up to 20%.

☑ CURES AT LOW TEMPERATURES

This clear-baking varnish cures at low temperatures. A baking cycle as low as 212 F is successful in conventional baking equipment.

☑ PENETRATES DEEPEST COILS

G-E 9574 easily penetrates the deepest coils, forms an even film. Aging properties are excellent.

**G-E 9574 gives excellent results on all types of coils except extra high-speed armatures.*

MAKE YOUR MOTOR REPAIRS EASIER, MORE EFFICIENT BY USING G-E 9574!

Get more information on this remarkable general-purpose insulating varnish. New bulletin gives you full details. Just write to your local G-E Distributor or Chemical Department, General Electric Company, Pittsfield, Mass.

You Can Put Your Confidence in

GENERAL ELECTRIC

CD49-M2

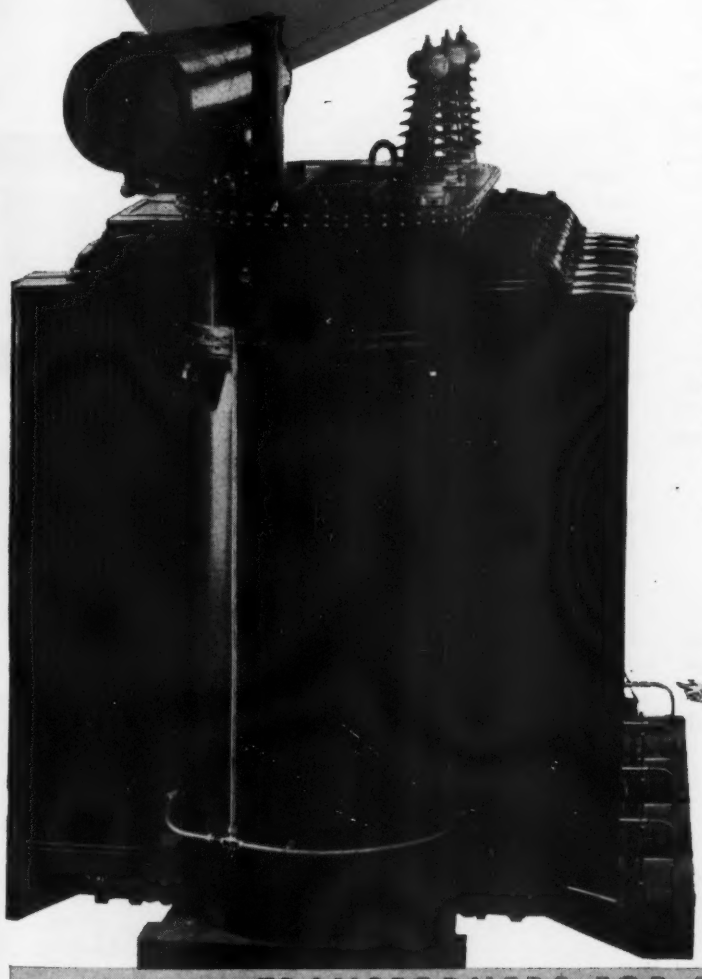
Standard

TRADE MARK ®

The Seal of Transformer Dependability

Your transformer needs are specifically met by STANDARD, because our facilities are exclusively devoted to transformer design and manufacture. Difficult assignments have been our meat. We design and build to your specific needs, and all designs meet NEMA and EEI standards. Use STANDARD'S quarter of a century of experience to make your installations adequate, safe and dependable.

Pictured here is a 10,000 KVA three phase power transformer designed for a specific application. Forced air cooling for 25% load increase is supplied. Used for step-up from 13,200 to 69,000 volts. Discuss YOUR transformer requirements, whether large or small, with the nearby Standard Transformer Company representative.

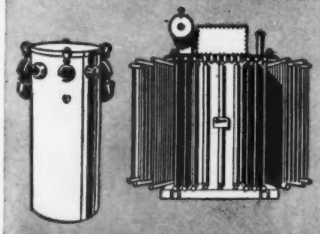


THE STANDARD TRANSFORMER COMPANY

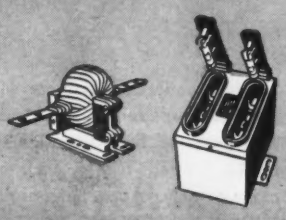
WARREN, OHIO

Representatives in Principal Cities

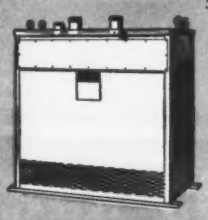
TRANSFORMERS FOR EVERY APPLICATION



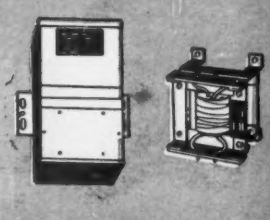
Liquid filled (sizes up to 10,000 KVA and 72 KV inc.)



Instrument transformers (for use on circuits up to 72,000 volts, inc.)



Dry type (up to 1000 KVA and max. voltage ratings of 4800)



Control transformers (compound filled or open type)

AUTOMATIC LOCKING
Midget EVER-LOK
PLUGS, RECEPTACLES AND CORD CONNECTORS
FOR COMMERCIAL AND INDUSTRIAL APPLICATION
10 AMPERES, 250 VOLTS — 15 AMPERES, 125 VOLTS — A. C. OR D.C

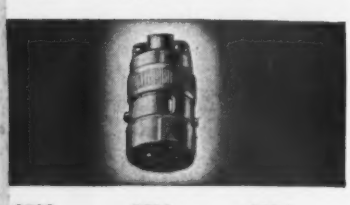
Available in various combinations to meet specific requirements.

CATALOG NUMBERS

2 Wire 2 Pole	2 Wire 3 Pole	3 Wire 4 Pole

8712 8713 8714

Male plug interior in steel enclosure, cadmium plated finish. Complete with sponge rubber dust-tight bushing and cable grip. Maximum cable diameter ½ inch. Appr. net weight ¼ lb.

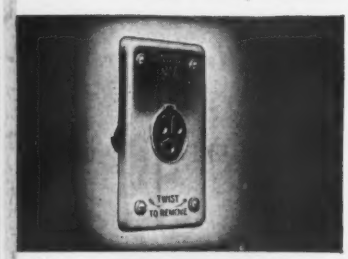


8722 8723 8724

Female connector interior in steel enclosure, cadmium plated finish. Complete with sponge rubber dust-tight bushing and cable grip. Maximum cable diameter ½ inch. Appr. net weight ¼ lb.

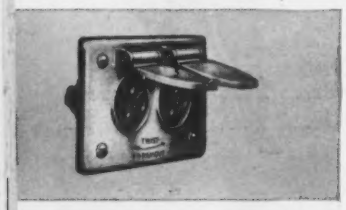
8702 8703 8704

Single receptacle complete with heavy gage steel cover with gasketed flap, cadmium plated finish. Fits types FS and FD conduit boxes. Appr. net weight ½ lb.



8802 8803 8804

Single receptacle complete with heavy gage steel cover without flap, cadmium plated finish. Fits types FS and FD conduit boxes. Appr. net weight ⅜ lb.



732 8733 8734

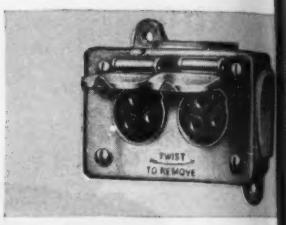
Duplex receptacle complete with heavy gage steel cover with gasketed flaps, cadmium plated finish. Fits types FS and FD conduit boxes. Appr. net weight ⅝ lb.

8832 8833 8834

Duplex receptacle complete with heavy gage steel cover without flaps, cadmium plated finish. Fits types FS and FD conduit boxes. Appr. net weight ½ lb.

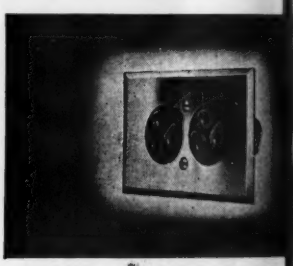
CATALOG NUMBERS

2 Wire 2 Pole	2 Wire 3 Pole	3 Wire 4 Pole



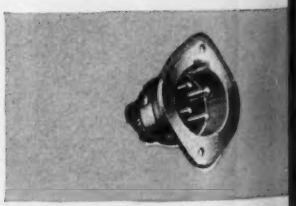
8772 8773 8774

Duplex receptacle complete with heavy gage steel cover with gasketed flaps, cadmium plated finish, and type FS single gang cast iron conduit box. Appr. net weight 3⅝ lbs.



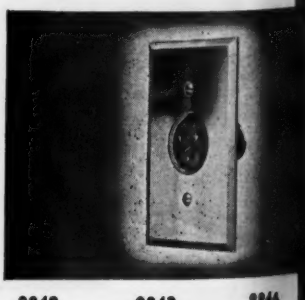
8862 8863 8864

Duplex receptacle complete with .060 inch brass flush plate without flaps, brush brass finish. Fits standard 4 inch outlet boxes with raised covers. Appr. net weight ½ lb.



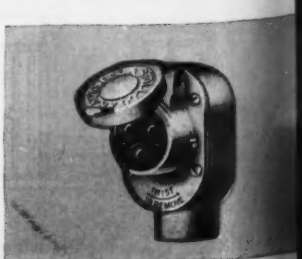
8942R 8943R 8944R

Single male receptacle interior in flanged steel casing, cadmium plated finish. Appr. net weight ⅛ lb.



8842 8843 8844

Single receptacle complete with .060 inch brass flush plate without flap, brush brass finish. Fits standard 4 inch outlet boxes with raised covers, or single gang switch boxes having 2 inch minimum depth. Appr. net weight ⅜ lb.



8792 8793 8794

Single receptacle complete with cast aluminum conduit fitting and cover with gasketed flap, corrosion resisting finish. Tapped for ½ inch conduit, one way only. Appr. net weight ⅝ lb.

Sold through Electrical Wholesalers

Sales Representatives in Principal Cities

The new Automatic Locking Midget Ever-Lok Plugs, Receptacles, and Cord Connectors are designed for many applications where space is limited, or units of smaller size are desirable. Used wherever safe, reliable performance is vital, such as in business offices, hospitals, institutional buildings, and industrial plants. Readily adaptable for use as a component for all types of portable electrical equipment, including recorders, communication and sound equipment, electric machine tools, X-ray and medical apparatus, and many other types of equipment.

Midget EVER-LOK

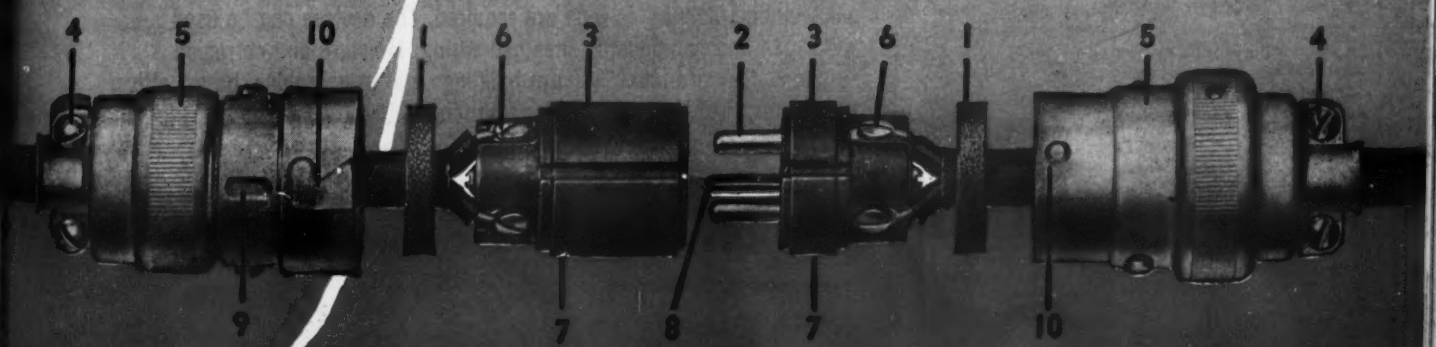
Midget Ever-Lok units embody all the dependable features of the well-known larger size Ever-Lok units, plus many advantages achieved by improvements in design and materials.

Write for new, 12-page Catalog EL49-4.

Russell & Stoll's leadership in the manufacture of precision-built electrical equipment is the result of over four decades of specialized engineering experience and skilled craftsmanship. R&S products are recognized everywhere as the standard of value for materials, workmanship, and quality.

The midget EVER-LOK plug is automatically locked when inserted into a midget EVER-LOK receptacle or cord connector. They can be readily unlocked by a twist of the wrist. The fool-proof bayonet type lock is simple and also serves to polarize the connectors. The spring action of the plug is durable and designed to give years of trouble-free service.

1. Dust-proof—A thick sponge rubber washer is provided in each cap, to be forced over the cord. This serves as a bushing and also as a shield to exclude metal particles, dust, etc., from interiors of Plugs and Connectors.
2. Contacts—Precision made, self-wiping, and self-aligning.
3. Interiors—All interiors of molded arc-resisting composition.
4. Cord Grip—Plugs and Connectors are provided with adjustable cord grips preventing strains on connections.
5. Entirely steel-clad—cadmium plated.
6. Terminals located for most convenient wiring.
7. Positive Grounding—Casings are positively grounded by springs insuring protection of workmen against accidental short-circuits.
8. Equipment grounding is secured by separate set of beryllium contacts which "make" first and "break" last (as required by Underwriters Laboratories).
9. Housings and Interiors are indexed for fool-proof assembly.
10. Polarized to prevent cross connections.



SINCE 1902

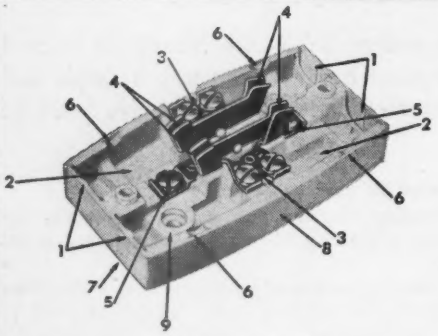
RUSSELL & STOLL COMPANY, INC.

Precision-Built Electrical Equipment

125 BARCLAY STREET, NEW YORK 7, N. Y.

WHEN WIRING COMES OUT IN THE OPEN

THE ANSWER IS BRYANT



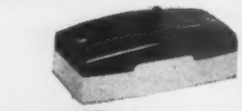
1. Knockouts take No. 12 or No. 14 standard non-metallic sheathed cable
2. Ample room for crossovers.
3. Terminals are easy to wire. Wire looping and splicing are unnecessary.
4. Double-sided contacts (meets REA and Federal Specifications).
5. Buss bars provide third wire or feed through connections.
6. Knockouts in sides for knob and tube wiring.
7. Can be mounted on 2 x 4 stud.
8. Porcelain base withstands humid conditions.
9. Mounting screw holes.

WITH A COMPLETE LINE OF NEW SURFACE WIRING DEVICES

To meet every surface wiring requirement in rural, residential and similar installations, Bryant offers a completely new and improved line of devices. Featuring rugged construction and modern appearance, the line includes single-pole and three-way switches, a duplex convenience outlet, pull and keyless lampholders, a rosette and a junction box.

Porcelain bases for maximum insulation are combined with brown Bakelite covers for a pleasing modern design. To install, simply mount the device, run the wire and connect to the terminals. No separate boxes, connectors, soldering or tape are required. The devices can be used with open and non-metallic sheathed wiring. Moisture and corrosion resistant, they are ideal for farm buildings, garages, stables, barns, attics, basements, etc. Approved by Underwriters' Laboratories, Inc. and REA.

No. 4661 Single-pole switch



No. 4667
Pull chain lampholder

BRYANT
SUPERIOR WIRING DEVICES

THE BRYANT ELECTRIC COMPANY

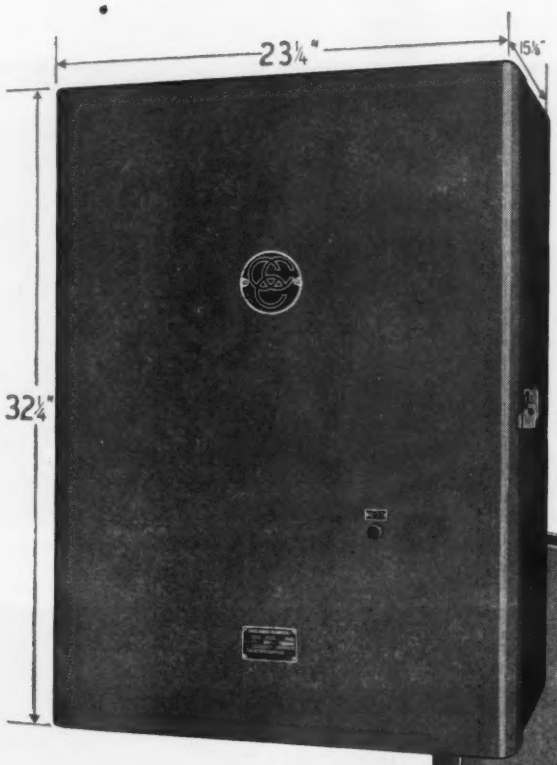
Bridgeport 2, Connecticut

CHICAGO • LOS ANGELES

SPECIFY BRYANT DEVICES FROM YOUR ELECTRICAL WHOLESALER

J-99826

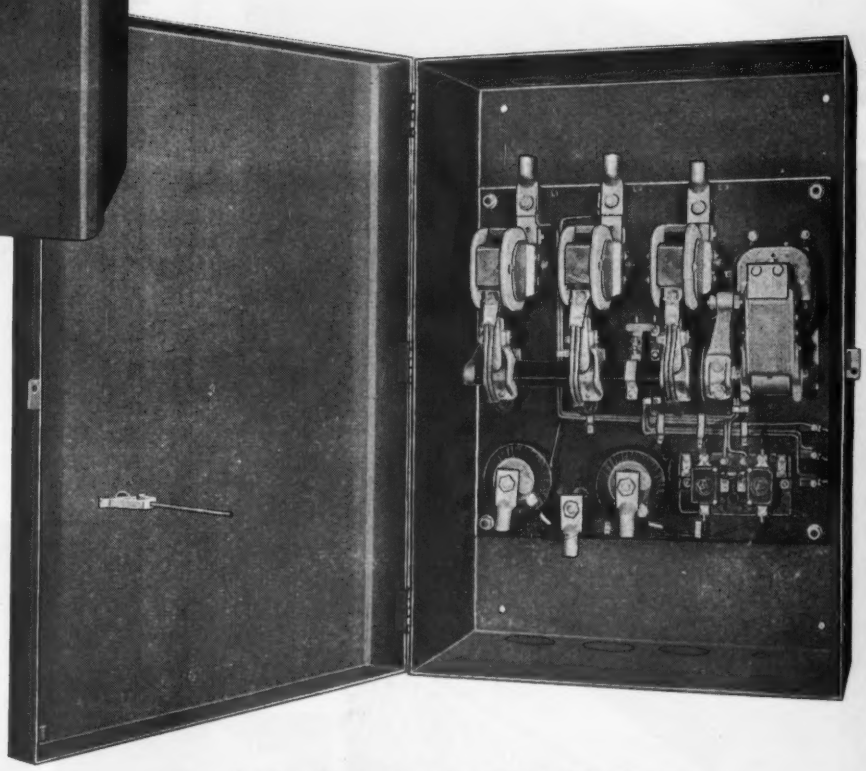
NEW! CLARK Bulletin 6013 Size 5 ACROSS-THE-LINE MAGNETIC STARTER



● Heretofore CLARK Size 5 Bulletin 6013 Starters employed Magnetic Overload Relays which had to be set to specific motor characteristics in our plant.

This Starter has now been re-designed to employ the well-known CLARK Bulletin 7322 Thermal Overload Relay, which can be set, in the field, to various motor characteristics by simply changing standard heaters.

The use of this Thermal Overload Relay is accomplished by means of "Do-Nut" type current transformers mounted on the load terminals, as clearly shown in the illustration.



The sturdy Bulletin 7700 Contactor, Overload Relay, and Current Transformer are mounted on a 1" x 20" x 21" slate panel, and enclosed in an attractive NEMA Type 1 cabinet. Other type cabinets will be available—all providing plenty of wiring space and clean-cut knockouts, top and bottom.

These newly designed Size 5 Starters are now carried in stock.

This new design of starter will soon be incorporated in CLARK Bulletin 6018 Combination Starter, which includes both Starter and Safety Switch in one cabinet, either fusible or non-fusible.

Available through your Clark Distributor.

THE CLARK CONTROLLER CO.

EVERYTHING UNDER CONTROL • 1146 EAST 152nd STREET, CLEVELAND 10, OHIO

Wm. PENN FLUORESCENT LIGHT MFRS.

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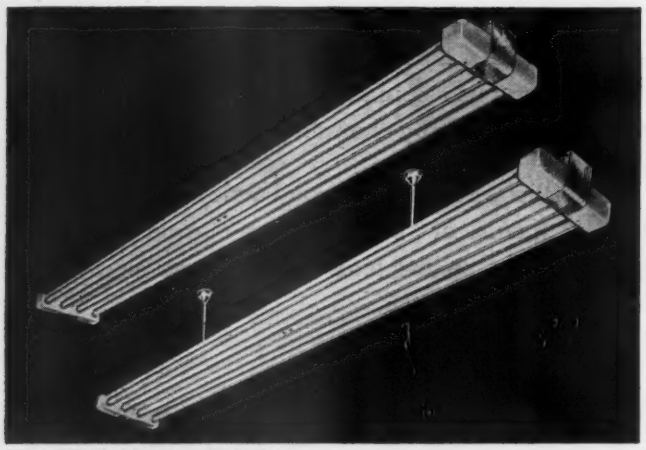
SLIMLINE fixtures that will delight your customers on looks, performance and price. Instant light without starters. Flush and pendant mounting, for single or continuous row. 2 and 4 tubes. Length 96". 100, 200, 300 MA. Simplicity of construction makes installation and service easy. Straight metal perforated sides and stamped metal ends, white enameled, with bright-metal trim.

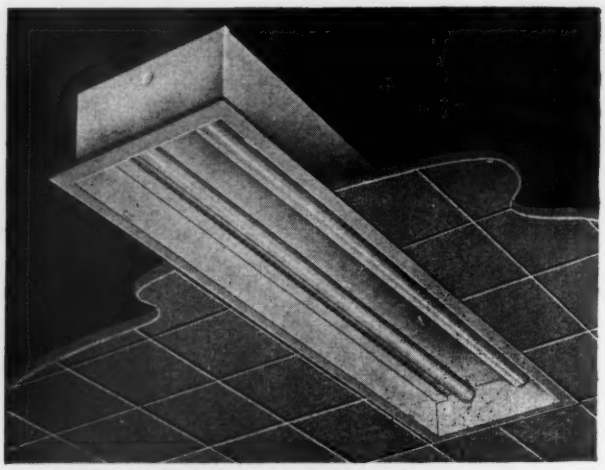


Wm. PENN Slimline #97 Open

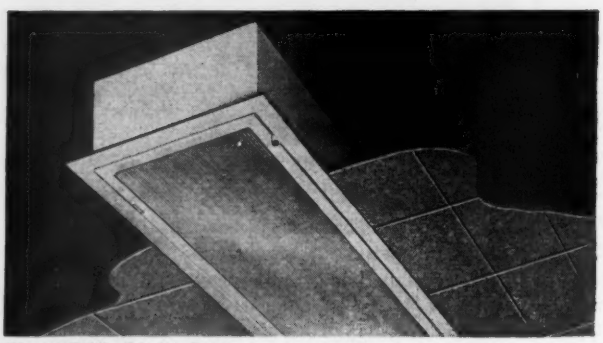
Wm. PENN Slimline #97 with Hinged Louvre

Sold through Wholesalers

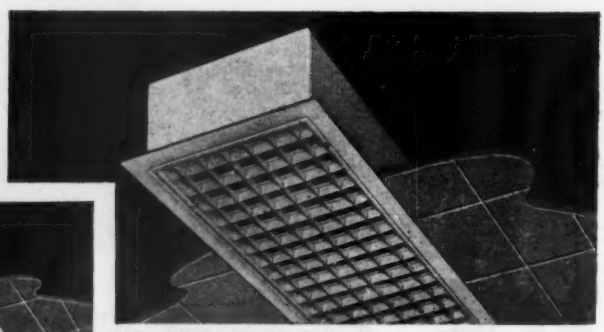
RECESS units that are most adaptable, efficient and economical. Beautifully designed for 2, 3 and 4 tubes (40-watt), single or continuous mounting. These are your fixtures for recessed lighting.

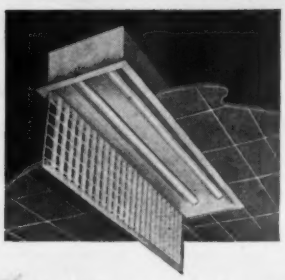


Wm. PENN #2-48 R. O. T. (Also 3 & 4 tubes)
Open-type troffer for direct, high-intensity lighting.



Wm. PENN #2-48 R. G. (2 tubes only)
Good looking unit with hinged shield of Pentacor glass.
Efficient delivery of diffused light.





Wm. PENN #2-48 R. L. (Also 3 & 4 tubes)
For shadowless light in schools, offices, drafting rooms, etc., this unit has an attractive louvre that drops down for convenient cleaning and servicing.

Write for Catalog of complete Wm. PENN line

EXPLOSION-PROOF PYLETS ... for Hazardous Locations

EXPLOSION-PROOF SWITCH PYLETS

1. *TUMBLER SWITCHES with push-pull Rod* to control motors or lighting circuits in hazardous locations. 1 and 2 gang, 1, 2 and 3-pole, 10 to 30 ampere, also 3 way and 4 way, 10 and 20 ampere types.

2. *TUMBLER SWITCHES with interlocking Plug* Receptacle for use as service outlets for portable electrical equipment in hazardous locations. Plugs cannot be inserted or withdrawn unless switch is open. Switch cannot be closed unless plug is fully inserted. 2 and 3-pole, 20 and 30 ampere, 250 and 460 volt ratings.

3. EXPLOSION-PROOF SECONDARY CIRCUIT BREAKER PYLETS for protection of motors against overloads and stalled rotor currents. Can also be used for "on" and "off" switch. Single and double pole with a selection of interchangeable heater units for protecting fractional horsepower motors.

4. EXPLOSION-PROOF UNIVERSAL JUNCTION PYLETS—6, 7 and 10 hub types with close-up plugs. For easy replacement of sheet metal knockout boxes in the rewiring of old gasoline pump installations.

5. EXPLOSION-PROOF JUNCTION PYLETS available in a wide selection of styles and sizes with threaded or union type hub. Furnished with plain covers for general use or with covers tapped for conduit to support lighting fixtures. Also furnished with pipe plug angle type cover for filling with sealing cement.

6. PYLE-O-FLEX flexible explosion-proof and watertight fittings for adjustable and vibrative connections to motors, floodlights and pendant type lighting fixtures. Furnished in any combination of male and female threaded or female union type end connections with flexible lengths of 4 to 36 inches, conduit sizes ½" to 2" inclusive.

7. EXPLOSION-PROOF SEALING PYLETS have removable pipe plug covers which can be mounted in any one of four positions for filling with cement. Used to isolate the wiring compartments of arc-producing devices from balance of conduit system.

EXPLOSION-PROOF UNIONS, male and female, straight and 90° elbow types.

A line of the most commonly used types of conduit fittings for hazardous locations as defined in Article 500 of The National Electrical Code. Explosion-proof Pylets are designed in accordance with Underwriters' Laboratories requirements and are classified in their list of inspected electrical appliances. Their substantial construction and the high quality of materials and workmanship insure safety, uninterrupted service and long life. Consult your Pylet Catalog 1100 for complete listings of the above and other Explosion-Proof and Dust-Tight Pylets.

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BOUNCE IT

Bounce an O. Z. All-Bakelite Insulating Bushing hard, on a concrete floor — it rebounds good as new. Add to its superior strength* these extra features and you've got a bushing that's best by any test!

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- **Ribbed outer surface provides a grip for slippery hands and permits tapping with a screw-driver.**

O. Z.'s New All-Bakelite Insulating Bushings are fully approved by Underwriters' Laboratories, meet all requirements of the National Electric Code.

Try a few, bounce 'em, treat 'em rough and you'll be convinced there are no all-Bakelite bushings better suited to the job . . . none so economical to use as O. Z.'s.

Available in sizes from ½ inch to 6 inches, cost no more than ordinary Bakelite bushings. Samples on request.

*56% stronger over all than all other leading all-Bakelite bushings actually tested by an independent laboratory.

CONDUIT FITTINGS • CABLE TERMINATORS
CAST IRON BOXES • GROUNDING DEVICES
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Buy O. Z. and you'll see why Engineers say, "They're OK if they're O.Z."

O.Z. ELECTRICAL MANUFACTURING COMPANY, INC.

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Q. What kinds of wiring jobs is ALUMINUM recommended for?

A. Any job, especially where load and conductors are large.

220/110-volt secondary feeders for a softball field lighting system. Maximum run, 375', maximum voltage drop, less than 2 per cent. 300 mcm aluminum, insulated, direct burial.

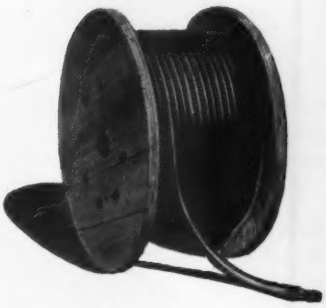
From softball fields to multi-million dollar industrial plants, aluminum wire delivers the electrical load at lower cable cost.

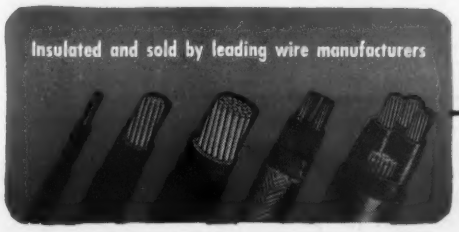
You'd expect insulated aluminum wire and cable to be the lightest for any duty—and you'd be right! It's that light weight that means easier handling on bigger electrical jobs—helps you give your customers good wiring for less money.

Alcoa makes light, strong, conductive E.C.* Aluminum; leading wire and cable manufacturers draw, strand and insulate it, and sell it under their own trade marks. Ask your wire supplier about it, or write ALUMINUM COMPANY OF AMERICA, 2197 Gulf Building, Pittsburgh 19, Pennsylvania.

*E.C.: *Electrical Conductor* Aluminum

The BIG DIFFERENCE is in your COSTS!





ALCOA EC ALUMINUM

ALCOA ALUMINUM

FOR ELECTRIC WIRE AND CABLE

SEALED BEARINGS PROTECT R & M MOTOR PERFORMANCE

•

No re-greasing for at least Five Years

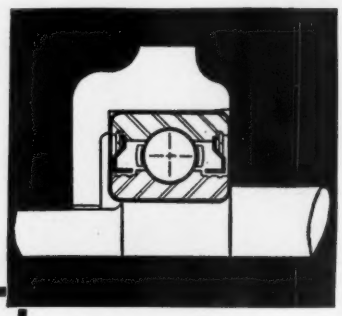
• Year after year without oiling—that's an important, *money-saving* advantage of Robbins & Myers Uni-Shell motors. And it's a typical benefit of the attention to detail that makes these motors so dependable. To provide this "protected performance," every R & M Uni-Shell motor has pre-lubricated, *sealed* ball-bearings.

YOU SAVE ON MAINTENANCE

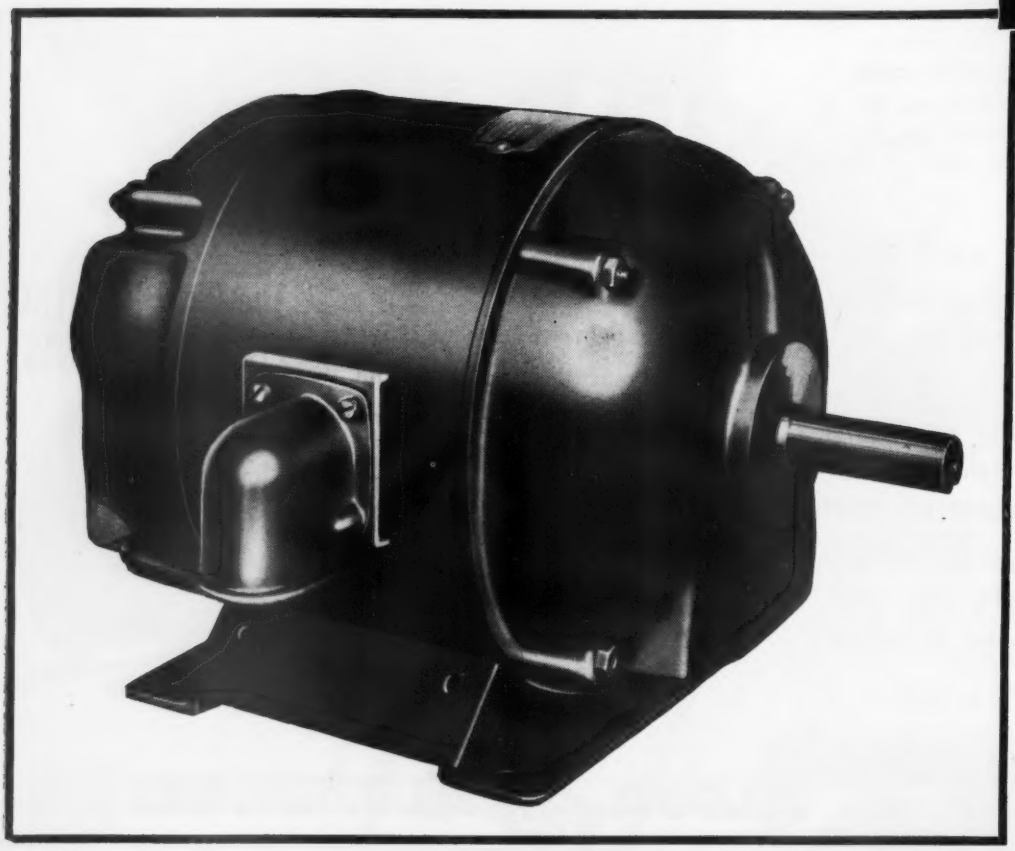
R & M bearings are factory-lubricated for *at least five years.* They are double width, with an extra-large grease reservoir. Bearing seal keeps grease in, dirt out—prevents destructive over-lubricating. And the precision construction of Uni-Shell housings assures perfect, *permanent* alignment. This type of bearing, proved first in the laboratory by complete quality-control tests—including vibration, temperature, and corrosive salt spray—gives outstanding performance under all service conditions.

AVAILABLE ON ALL MOTOR TYPES

Drip-proof, splash-proof, or totally enclosed, with and without fan cooling, R & M sealed-bearing motors include all types . . . for every purpose . . . in sizes to 30 H.P. Be sure *you* get protected performance—get *R & M* motors. Prompt delivery. Write for free Catalog No. 1845. Robbins & Myers, Inc., Motor Division, Dept. B-49, Springfield 99, Ohio.



The trouble-free, cartridge-type bearing.



R&M *Uni-Shell* MOTORS

Save with modern distribution systems using WESTINGHOUSE Dry-Type Transformers

If you are expanding or relighting your plant, you can lower operating costs and gain greater efficiency feeding motors and lights by using a modern distribution system.

In such a system, higher voltages are brought close to the load and are stepped down at the motors and lights they serve with modern, dry-type transformers.

You will:

GET BETTER REGULATION
SAVE COPPER
SAVE INSTALLATION COSTS
REDUCE OPERATING EXPENSES

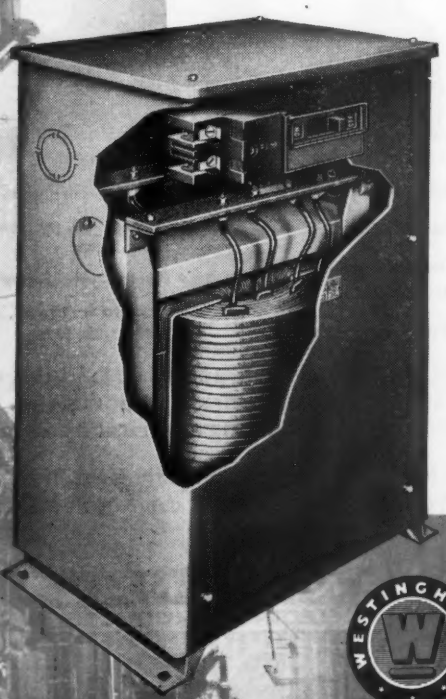
And Westinghouse dry-type transformers will give you additional advantages of **SMALL SIZE AND LIGHT WEIGHT,** important to the men who actually install the transformers.

To get these extra "plus" advantages, Westinghouse leadership in engineering introduced Class B insulation and developed HIPERSIL*, the steel that carries one third more magnetic flux.

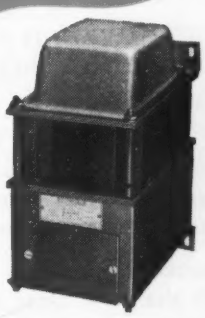
That same engineering is ready to assist you with the proper application of dry-type transformers in the distribution system best suited to your needs. Call or write your near-by Westinghouse office for your copy of Booklet B-4009. Westinghouse Electric Corporation, Transformer Division, Sharon, Pennsylvania. J-70517

Reg. U. S. Pat. Off.

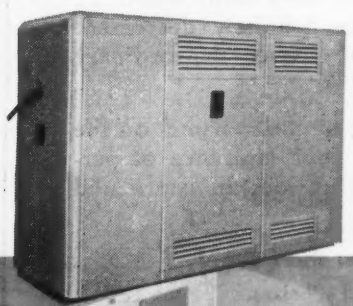
YOU CAN BE SURE IF IT'S Westinghouse



A NEW FEATURE—Two popular dry types, AJR and AVR, are now offered with or without a built-in circuit breaker. With this new feature, the need for separate protective devices is reduced. AVR-B (with breaker) is shown at left.



ABOVE—Type GP which, with type MT, are small, class A insulation transformers serving loads under 2 kva.



LEFT—Dry-type power center, used indoors as part of modern industrial distribution.

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

"LEADERSHIP IN TRANSFORMER DEVELOPMENT . . . FOR EVERY POWER DISTRIBUTION JOB"

There's Something New INSIDE*

National Electric XDUCT JUNIOR
Electrical Metallic Tubing

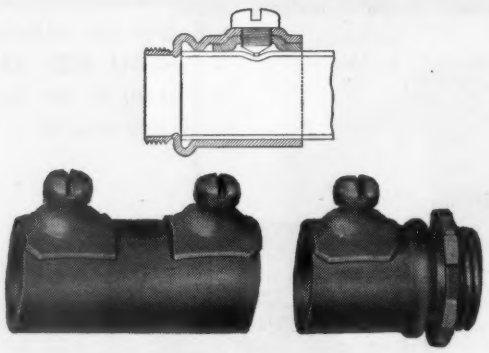
Look inside the *new* XDUCT JUNIOR and you'll see a hard, mirror-like finish.

- XDUCT JUNIOR is first electro-galvanized under an exacting control that produces a uniform, unbroken zinc coating.
- The inside is then further protected by a *complete* covering of clear enamel that will not crack or break down even under severe baking and bending. Weather elements have no effect on it.
- Exhaustive tests have proved XDUCT JUNIOR, coated with the new clear enamel, is more easily fished . . . resistance to wire pulling is definitely decreased. Appearance is improved 100% over the ordinary black enameled finish.
- The smooth, lustrous coating of clear enamel on the inside of XDUCT JUNIOR, is your assurance of permanent protection against abrasion, moisture and corrosion.

Now XDUCT JUNIOR is *better than ever!*

*Currently available on the ½" and ¾" sizes.

USE THE NE IMPROVED E.M.T. FITTINGS WITH XDUCT JUNIOR



- Vibration proof
- Easy to inspect
- Installed with a screw driver
- Permanent ground
- Close, accurate fit
- One-piece, pressed-steel body
- Electro-galvanized
- Easy to install in close quarters

XDUCT JUNIOR and E.M.T. Fittings are listed by Underwriters' Laboratories, Inc. Sold through leading electrical wholesalers.

Write for a copy of *"New Fittings for E.M.T. are Vibration Proof."* It lists sizes and catalog numbers.

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WIRING SYSTEMS
WIRES AND CABLES

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PRODUCTS CORPORATION
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APRIL . . . . at a Glance

Terrace Plaza

Few new hotels have altered the skyline in recent years, but even if there had been many, Cincinnati's new Terrace Plaza would still represent a great contribuiton to modern design and electrical ingenuity. It is the subject of our outstanding electrical construction report this month, beginning on page 65. A complete break with tradition, the hotel starts on the 8th floor, resting atop a 7-story commercial building. A great many electrical features contribute to the safety and comfort of the guests and tenants. The area is completely air conditioned and electro-statically cleaned. Floor and table lamps have been eliminated in the lighting of guest rooms by ingenious built-in fixture designs. The building is completely wired for television. A spectacular terrace lighting system uses 90 kilowatts of concealed floodlighting, projecting from the 19th floor parapet. The project is a gold mine of practical ideas on modern wiring and utilization.

Radiant Heating

Although continuing power shortages offer a practical limit to the immediate prospects in electrical radiant heating, the public is interested and we can expect a continual growth in the years to come in the application of these systems. In this issue we are beginning a series of articles which will explore the methods and practices for designing and installing various types of electrical space heating apparatus. The first of these articles discusses a resistance wire type of panel heating installation which was pioneered in the Northwest. It begins on page 74.

Industrial Kitchens

Modern industrial kitchens have to include not only the optimum facilities of good restaurant practice, but their design and operation is under the critical eye of executives who are well versed in the high standards of modern industrial efficiency. A good example is a kitchen cafeteria recently completed in one of Jersey's chemical plants. Of course, it is electrical, served by a well designed wiring system and arranged for the best in economy and efficiency. Electrical contractor A. Neri handled the job. The story begins on page 78.

Library Lighting

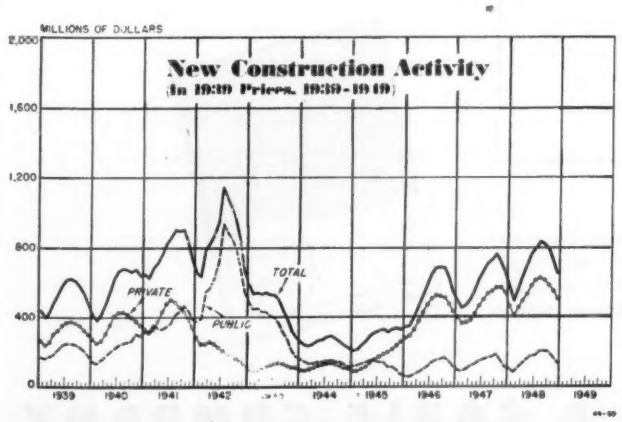
Library lighting is difficult at best, what with the need of high levels of illumination with minimum glare and the kind of seeing comfort necessary where folks must spend long periods in concentrated study. The project at Harvard's Baker Library had the further requirement that the lighting system represent the most advanced lighting techniques and still retain a quiet and inconspicuous quality in character with the building, its traditions, and its use. The lighting installation was made by the Hixson Electric Company, Boston, and the story by John A. Bernard of that company begins on page 80. It is a splendid example of planned lighting methods applied to a difficult job.

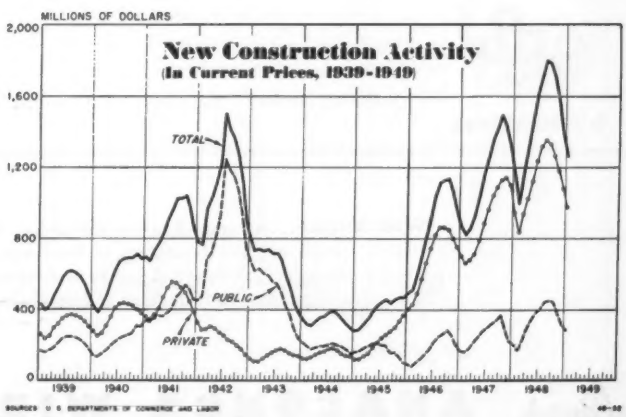
Drains for Motors

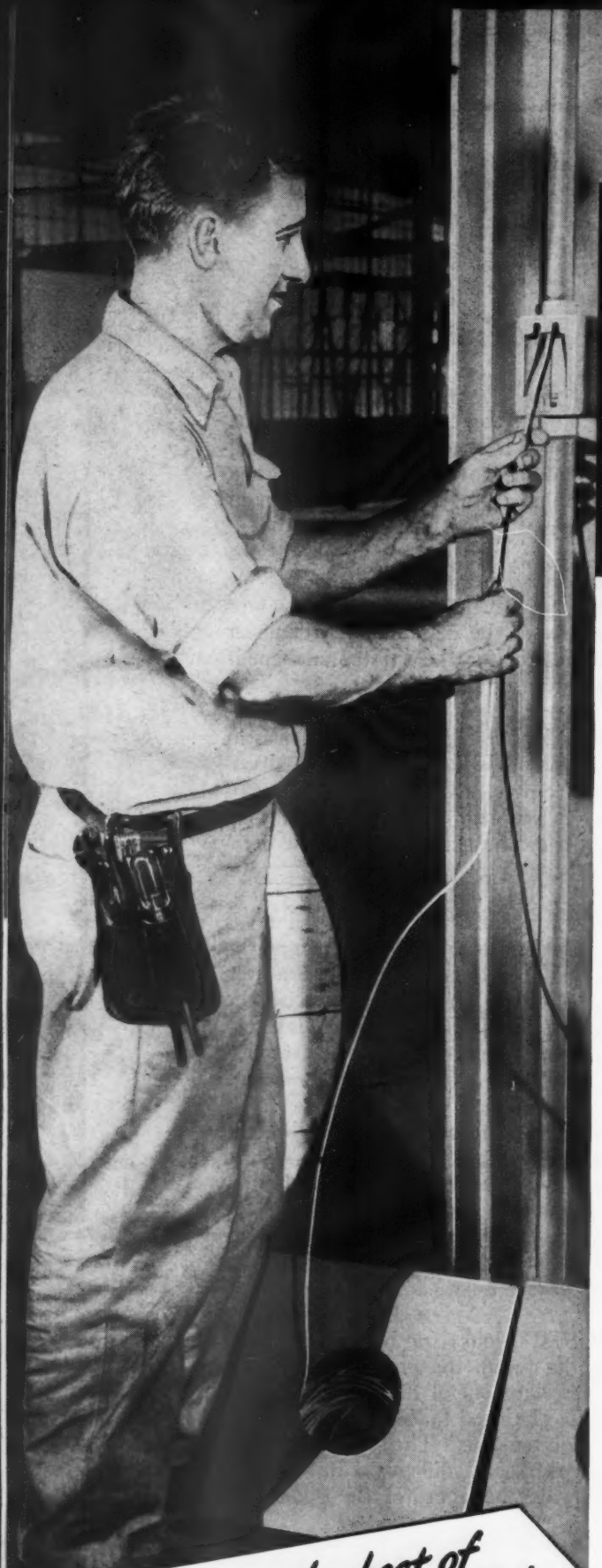
Totally enclosed and fan-cooled motors tend to breathe in humid atmospheres with resulting condensation inside the motor frame. Trouble can be prevented if the condition is recognized and the proper measures taken to prevent accumulation of water. J. M. Hillman of Allis-Chalmers describes the problem and its solution in his article, "Enclosed Motors Need Drains," on page 84.

Planned Lighting Maintenance

Our editorial feature section on Planned Lighting Maintenance last month brought in a number of inquiries as to whether the material was available as a reprint. It is, at nominal cost, but the quantity available is limited. Get your request in early.







PUSH that wiring job

. . . with Supplies from Graybar

You and your customers both benefit from the wiring job that winds up "on schedule." Don't let hit-or-miss selection of items, uncertain deliveries, and mis-matched parts mean disgruntled customers and loss of time and money for you. On your next job, play it safe — order from Graybar. We give you prompt deliveries of a wide variety of wiring supplies — plus practical advice from men familiar with every kind of wiring installation.

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For a major wiring contract, or minor repairs, you can get the right materials for the complete job from Graybar. We distribute thousands of different wiring items as well as the tools needed to install them. For your protection, we have been particularly careful to select only *first-quality* products of leading manufacturers. You'll lose no time because of "duds," and all the items will fit together properly on the job.

SPECIALIZED HELP

To help you and your customer plan complicated wiring systems or solve difficult wiring problems, a Graybar Inside Construction Specialist is available for consultation. His recommendations, supplementing those of your local Graybar Representative, will help to speed up performance of your contract from start to finish.

100,000 Electrical Items

Graybar offers you similar service for all your other electrical needs. For dependable supplies and for help in speeding lighting, communication, ventilation, and other electrical installations, call our nearest office. *Graybar Electric Company, Inc. Executive offices: Graybar Building, New York 17, N. Y.* 4938

IN OVER 100 PRINCIPAL CITIES

You get the best of everything electrical

Via GraybaR

THE TERRACE PLAZA—*Cincinnati's newest hotel building.*

TERRACE PLAZA . . . of CINCINNATI

One of the nation's newest hotel structures looses the shackles of convention; employs the latest in electrical safety systems; emphasizes architecturally-blended, functional lighting in an ultra-modern design.

By Arthur E. Bertke
President, Bertke Electric Company
Cincinnati, Ohio

GUESTS at the swank new Terrace Plaza Hotel enjoy the quiet and refinement of penthouse living in the heart of Cincinnati's downtown business center. Combining modern design with compact built-in equipment, the architects created a feeling of spaciousness and homeliness enhanced by carefully chosen soft pastel decorations and custom-built lighting equipment that blends with the architectural pattern.

Breaking away from tradition, the architects located the hotel lobby on the eighth floor of the 19-story red brick structure—high above distracting street noises. The 400-room hotel rests on a seven-story windowless base (exception: street level store windows) that provides valuable rental property. Occupants of this cliff-like base are the Bond Clothing Store (five floors at one end); the J. C. Penney Company Store (seven floors at the other end); several small stores at street level; and several fan and equipment rooms serving the building.

The architects and engineers collaborated with the owners to provide the latest in comfort and safety to guests and tenants. Among the features incorporated in the structure are: Completely controlled indoor weather provided throughout the building by a Carrier central source air conditioning system. All air is electrostatically cleaned.

A photronic smoke detection system installed in the ventilating ducts detects fire in any hotel guest room or other area; actuates an alarm in the hotel engineer's headquarters.

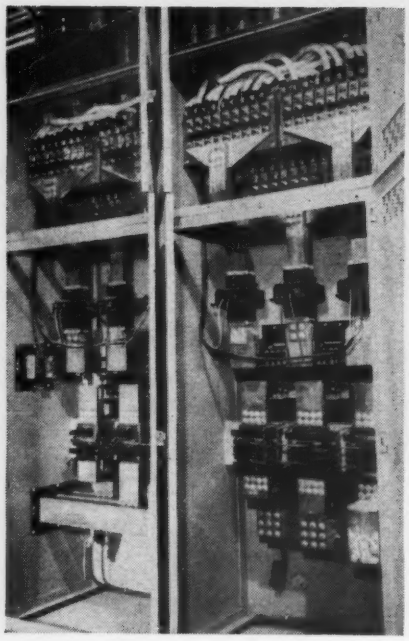
The outdoor cocktail terrace and skating rink (winter) on eighth floor is illuminated by 90 kilowatts of concealed floodlighting from the 19th floor parapet, 150 feet above. Motor operated mirrored doors swing out to direct light downward; remote controlled filters provide color changes.

Service trucks drop to a basement loading dock on an automatically controlled truck elevator. Eliminates street and alley traffic congestion.

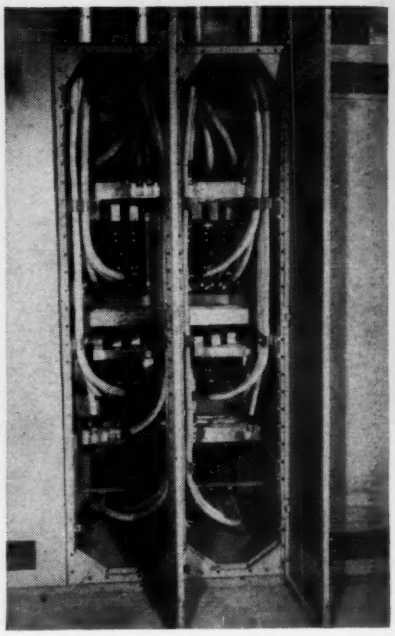
Included in the special electrical systems are such conventional items as sprinkler fire protection control, burglar alarm, time stamp and time clock systems, telephone and radio and intercom systems for hotel and store areas.

Combined, these systems make the Terrace Plaza one of the best equipped hotels in the country from the standpoint of electrical and safety features. And behind it all is a formidable electrical distribution and control system.

LOOKING DOWN PIPE SHAFT *where 26 conduit feeders swing up from main switchboard to feed 8th floor.*



SERVICE CONDUCTORS *split up at main switchboard to feed two 4,000-ampere breakers.*



LOOKING AT BACK *of two secondary feeder cubicles. Each has four 600-ampere breakers.*

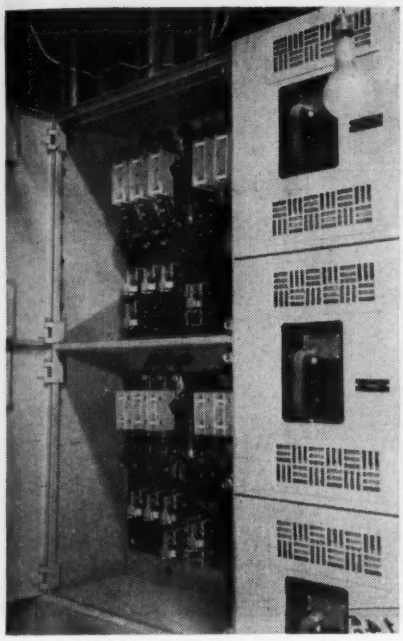
MAIN DISTRIBUTION *switchboard in sub-basement is 57-feet long; serves power and lighting feeders for entire building except air conditioning load.*

EIGHTEEN CONDUITS *bring 54 service conductors from outdoor vault to massive pull box over main breakers in switchboard.*

Distribution

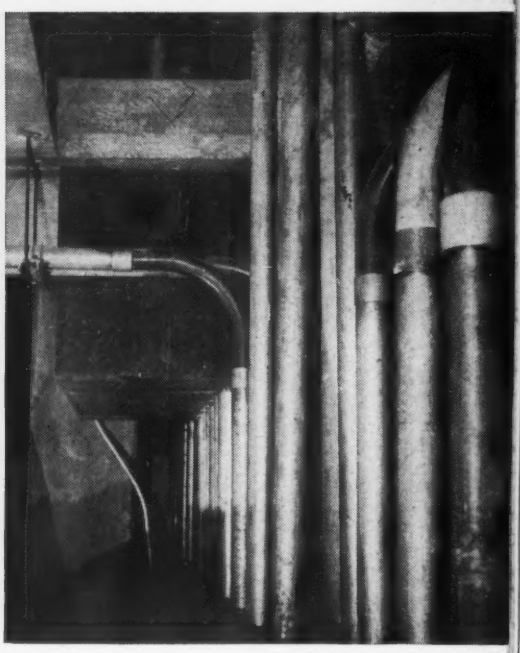
Two widely separated underground utility transformer vaults provide the power requirements of the entire building. Each vault, served by a separate feeder, has four 600 kva. transformers plus 200 additional kva. of network capacity. One vault feeds the air conditioning switchboard; the other feeds the 57-foot long main power and lighting switchboard which provides 120/208-volt, 3-phase, 4-wire distribution facilities.

Service feeders to this large board consist of 18 4½-inch, concrete encased conduits that drop more than 30 feet from the under-the-sidewalk vault to the ceiling of the sub-basement switchboard room. Because of this condition, heavy service bus could not be used. The feeders split at the switchboard and connect to two 4,000-ampere incoming circuit breakers—one for the Penney store load, the other for the combined Bond store and hotel loads. Secondary feeder cubicles (total of 19) each contain four 600-ampere breakers. A three-section automatic transfer switch cubicle



AUTOMATIC TRANSFER *switches shift emergency lighting load to a second switchboard and transformer vault.*

RISER SUPPORTS *for 24 4-inch conduits and feeder cables on sixth floor store area.*



LINE OF *secondary feeder conduits above one-half of main switchboard. Large pull box carries feeders around beam.*

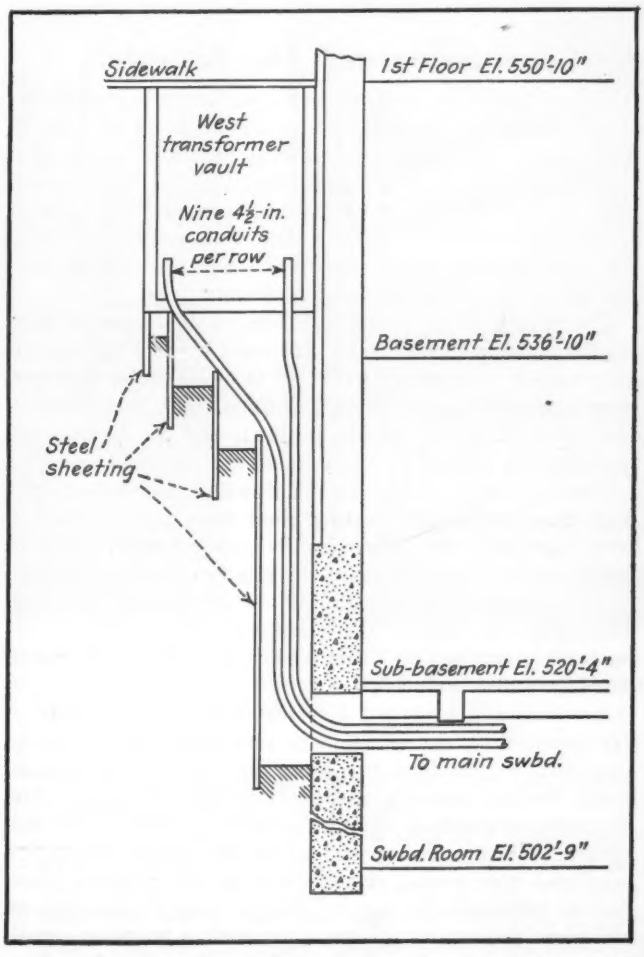
provides emergency service through a 1,500-ampere, 4-pole, low-impedance bus duct tie with the other switchboard. The normal complement of metering and submetering cubicles (for Penney, Bond and hotel) complete the main switchboard assembly.

Secondary distribution follows the conventional radial system. Groups of 24 or more conduits (2" to 3½"), with cables ranging from No. 1/0 to 500MCM in size, leave the main switchboard and go up various riser shafts to feed the Bond Store (EC&M, pgs. 60-63, August, 1948), Penney Store and hotel electrical systems. Branch circuit distribution also follows the radial pattern. Circuits to large compressor motors adjacent to the air conditioning switchboard consist of relatively short runs of bus duct to the machine locations.

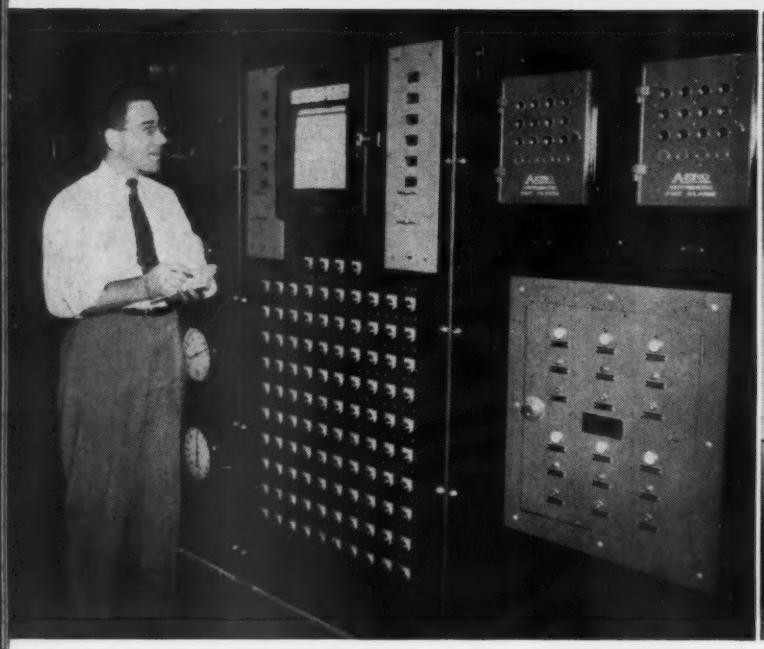
Provisions have been made to take care of possible future expansion of the electrical system. Space has been reserved in a sub-basement fan room for relocating the Bond Store distribution cubicles and connecting them to a third (future) utility transformer vault when expansion in power needs require.

More than 142 miles of wire and cable, seven miles of conduit and 2,500 feet of underfloor duct was used for the electrical distribution. This includes such auxiliary systems as telephone, radio, television, burglar and fire alarm, clock and time stamp systems.

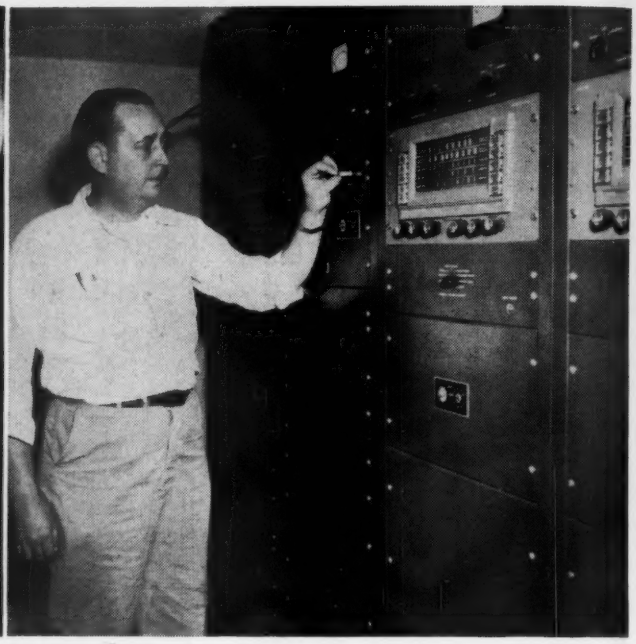
Conception of the tremendous extent of the distribution system can be obtained by considering the 3459 circuits controlled from 162 lighting and power panels located throughout the structure. Capacities of individual circuits range from 15-a. 1-p. to 50-a. 3-p. on the 126 lighting panels and continue up to 275-a. 3-p. on the power panels. Basement-based equipment includes the 250- to 700-hp. air conditioning compressors, forced draft fans and pumps (oil, gas booster, sump, ejector, condenser and circulating) and other apparatus.



SERVICE CONDUITS *drop from underground vault to feed main switchboard 48 feet below street level.*



MASTER CONTROL BOARD *in engineer's office has 104 pilot lights for air conditioning and air intake and exhaust fan motors. Panel at right has fire detection and smoke alarm indicators.*



EMERGENCY SWITCH *on hotel radio system control panel cuts in emergency channel to all receivers. Instructions can be broadcast from "mike" in radio room or manager's office.*

Air Conditioning and Fire Protection

Every cubic foot of space in the structure is completely air conditioned by a central source air conditioning system. Three large centrifugal refrigerating machines in the sub-basement, driven by 700 hp., 600 hp., and 250 hp. motors, have a total capacity of 1,500 tons of refrigeration. Guest rooms are served by 440 Conduit Weathermaster Units that can be individually controlled. Separate pumps and piping circuits serve the hotel and store areas.

The air handling system consists of 99 separate fans totalling approximately 500 hp. (from ¼-hp. to 30 hp. each) and ranging in capacity from 350 to 49,000 cubic feet per minute. Total air circulation approximates 1,200,000 cubic feet per minute. All outside air is cleaned by electrostatic precipitators located in the various fan room air intakes.

Central supervision of air conditioning, ventilation, fire protection system, and heating plant operation is provided from the engineer's office in the sub-basement. Here a master control board contains the master clock mechanism; meters, gauges and charts for the other systems; and 104 pilot lights that indicate the operating status of the various fan and pump motors. Fire detection and smoke alarm panels are also included.

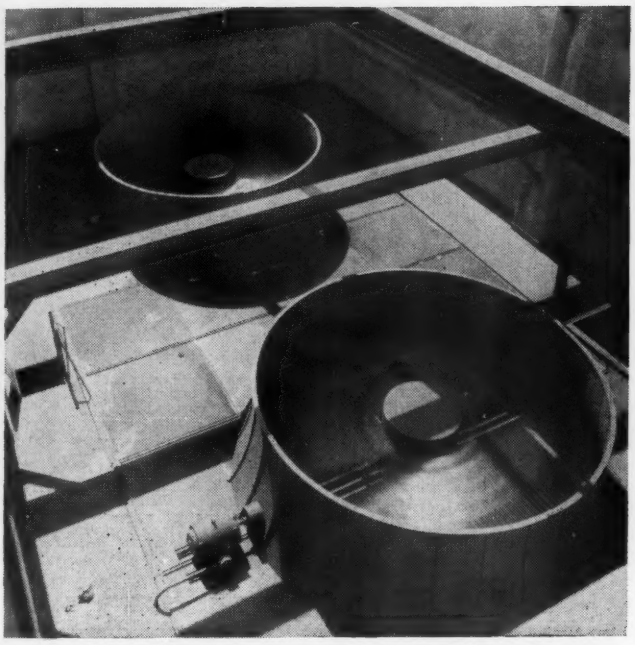
An automatic fire control system, consisting of electric-eye smoke detectors in 24 main ventilating ducts, constitutes part of the hotel fire protection system. These photronic devices instantly and automatically detect any fire or smoke originating within the ducts or drawn into the system. When a fire starts within the system (includes hotel and store areas) or anywhere on the premises, these devices automatically shut off the air conditioning system and close the proper dampers; transmit a warning signal to the engineer's office and a coded call to the American District Telegraph Central Office from which aid is immediately dispatched. An additional room detection system incorporates individual contact thermostats in each room. When heat from excessive smoke or flames closes these thermostats, the room number is registered on a clock-type annunciator and tape in the engineer's office in the sub-basement and manager's office on the eighth floor.

The smoke detector consists essentially of a light source for projecting a beam of light across the protected duct onto an adjustable glass mirror which reflects it back to a photo-electric cell receiving unit. When smoke decreases the intensity of the light beam, it causes an unbalance in a highly sensitive electrical circuit of the main control unit. This initiates the alarm in the engineer's and ADT headquarters. Provisions have been made for a distinctive trouble signal to be sounded in the event of a power failure, circuit break, or failure of any one of the detector components. Thus the system is never unknowingly inoperative.

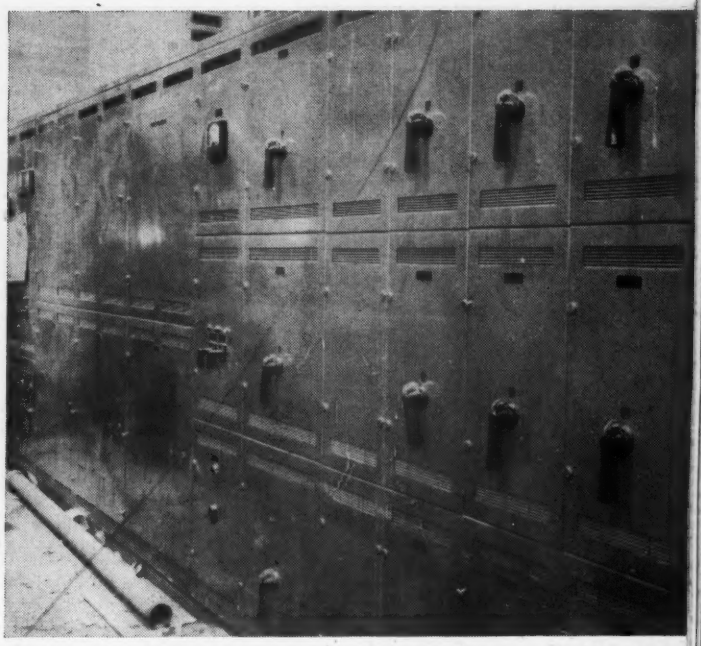
Open escalators were permitted in the J. C. Penny Company store primarily on the basis of installation of a radically new method of fire protection that utilizes controlled air. The new system combines the use of negative air pressure to isolate the fire, suction air to remove and exhaust the smoke and a deluge water curtain around the escalator opening. This is in addition to the conventional sprinkler system.

Two types of thermostats control the system. Should a fire occur, say on the third floor of the Penney store, rate-of-rise thermostats operate relays that start a 25 hp. exhaust fan on the seventh floor which, after operation of proper dampers in the ducts, draws the smoke from that floor up through high velocity air grilles surrounding the escalator wells. This creates a down draft and prevents smoke from going to other floors. If flames are present, a second quick

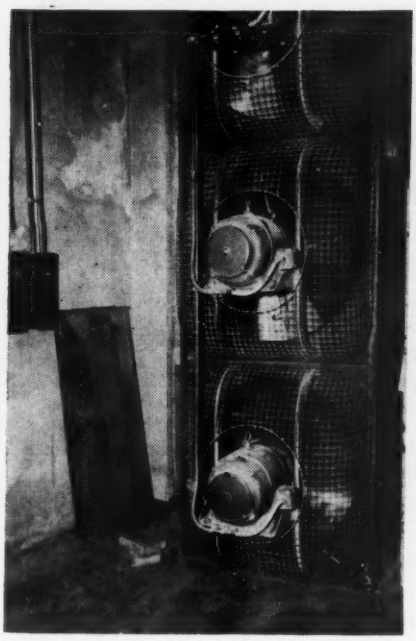
. . . Terrace Plaza of Cincinnati



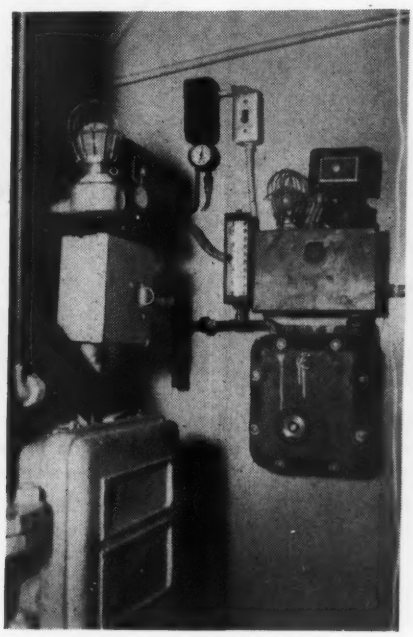
CIRCULAR EXHAUST *fans on roof draw the heat removed from the building by the air conditioning system, expelling it from the 19-floor structure.*



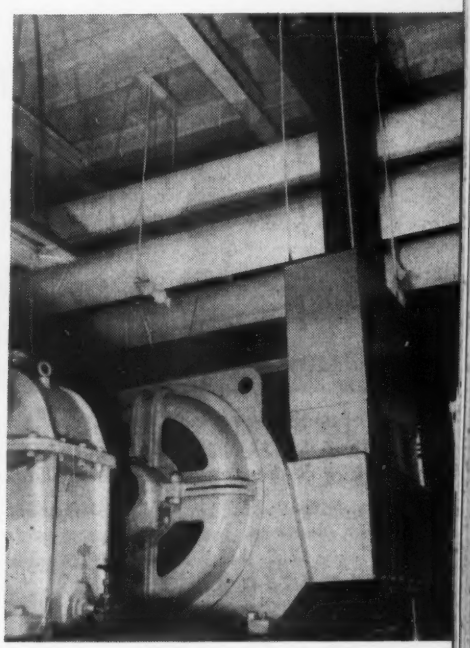
AIR CONDITIONING *switchboard is fed from a separate transformer vault; has a bus duct tie from main breaker to main power and light switchboard for emergency use.*



TRIPLE-TIER *of 3-hp., 30-inch "pusher" fans that will exhaust smoke in case of fire.*



ELECTRICAL RELAYS *in store area start interlocked fire protection system in operation in case of fire.*



BUS DUCT FEEDER *to a 700 hp. compressor motor in main air conditioning room.*

change-of-temperature thermostat (installed around escalator well) operates a sprinkler deluge system which, through stationary directional sprinkler heads, drops a curtain of water around the escalator well and confines the fire to the one floor.

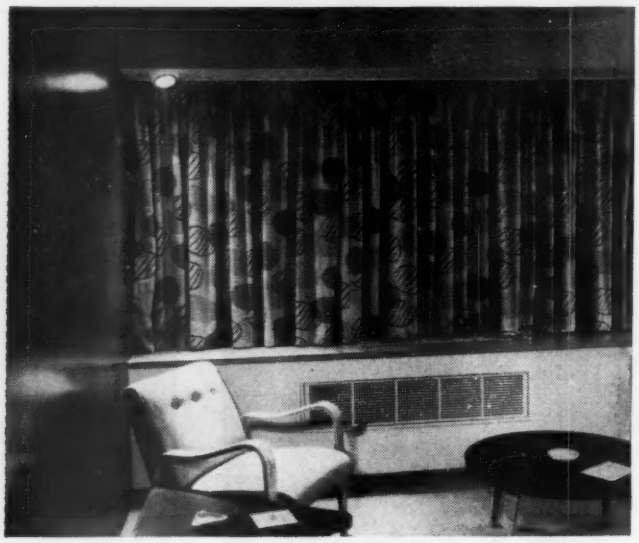
At the same time, automatic interconnected controls on the escalator motors stop those escalators carrying people *into* the affected area. Escalators carrying people away from the floor continue to operate. The store radio and intercom system can also be used to issue instructions to customers during such a situation.

The hotel radio system can be used in a similar manner to advise and instruct guests, either in public areas or in their rooms. A flip of a master switch in the radio control room cuts out all receiving channels and opens an emergency channel to two microphones—one in the radio room and one in the manager's office. Even if room radios are turned off, this channel can be heard.

REGISTRATION DESK *at eighth floor lobby is illuminated by sloping Abalite glass ceiling that covers 156 slimline lamps mounted on nine-inch centers.*

MAIN LOBBY AND LOUNGE *has rows of recessed 150-watt PAR incandescent lamps. Same units are used in main dining area.*

RECESSED CEILING *unit inside room entrance illuminates full-length wardrobe mirror and clothes bar. Built-in desk in back of clothes bar has concealed fluorescent lamp.*



EYE-BALL SPOT *in window recess provides 50 footcandles of illumination at reading level in chair. 150-watt PAR lamp is in louvered adjustable housing.*

Lighting

One of the most impressive features of the Terrace Plaza is the liberal and effective use of light that combines the decorative and functional with the interior architectural treatment. It is not only the quantity of light, but the way it is used that is evidence of the freedom given lighting engineer Abe Feder who was commissioned to apply modern lighting techniques to hotel requirements. Feder designed some 88 different types of custom-built fixtures for the hotel and store areas; introduced reportedly the first built-in fluorescent units for hotel guest rooms; liberally used slimline, conventional fluorescent, cold cathode (Bond store) and standard PAR reflector lamps to achieve his results. Spectacular lighting tricks, based on theatre lighting experience, were used to advantage.

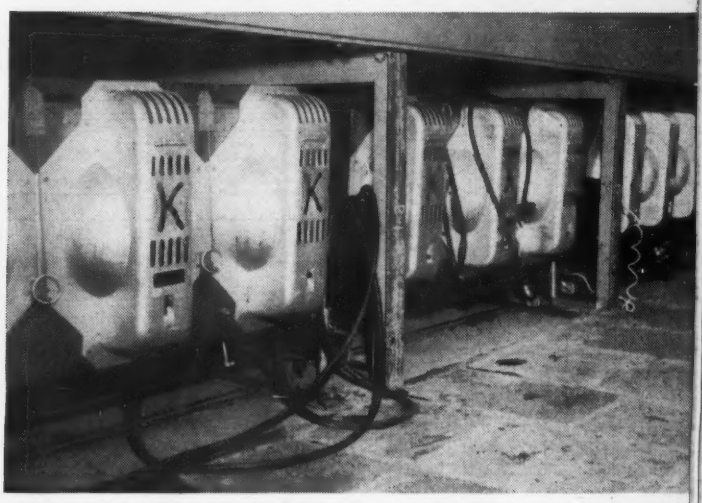
A few interesting facts substantiate the owner's and architect's convictions that lighting is important. Approximately 40 percent of the total electrical installation cost is represented by lighting fixture cost (excluding on-the-site wiring of units). Total list price of lamps in a typical Terrace Plaza guest room is $17.40 compared to approximately $1.50 for the average present-day hotel room with a single ceiling fixture and a few portable lamps.

Rows of recessed PAR 150-watt lamps in special housings are used extensively to illuminate the sidewalk canopy, elevator lobby (street level), hotel lobby (eighth floor), dining and public areas. Better than 80 footcandles of illumination on the registration desk is provided by rows of slimline lamps above a sloping Abalite glass ceiling.

Elevator areas on all floors are illuminated by continuous rows of recessed slimline units with louvers and diffusing

. . . Terrace Plaza of Cincinnati

BATHROOM LIGHTING *is provided by a glass-enclosed vertical slimline fixture at each corner of full wall mirror over dressing table.*



PARAPET DOGHOUSE *on 19th floor encloses terrace floodlights. Each "unit" consists of three 3,000-watt floodlights mounted on casters that roll into place on channel tracks.*

LAMPS IN TYPICAL GUEST ROOM

TWO 96-inch slimline (3500 white) in wall trough over beds.

TWO 64-inch slimlines (improved soft white) in recessed fixture over wardrobe full-length mirror.

TWO 42-inch slimlines (improved soft white) in vertical fixtures at sides of bathroom mirror.

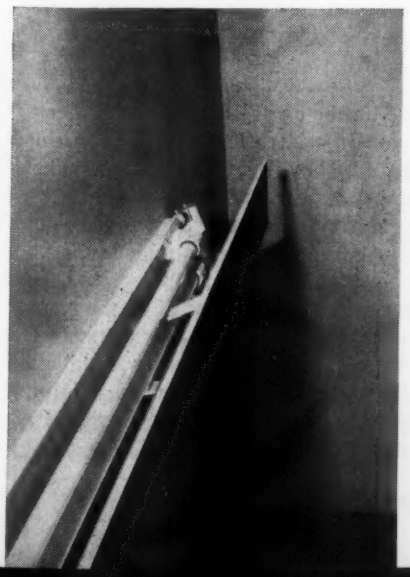
ONE 20-watt flourescent (3500 white) in writing desk.

TWO 75-watt R-30 incandescent reflector lamps (one at each end) in wall trough for bed reading lamps.

ONE 150-watt PAR incandescent projector spot built in window recess for reading in chair.

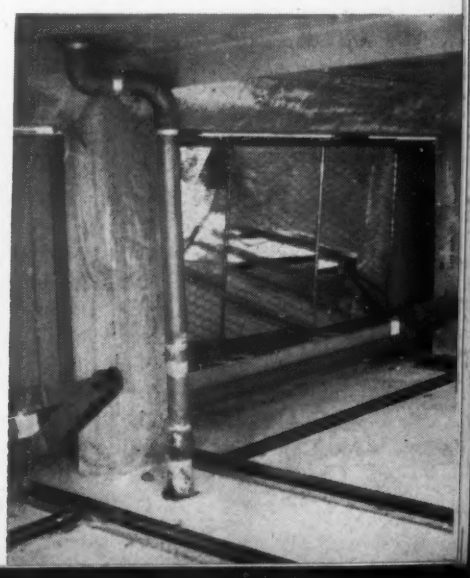
MAIN KITCHEN *of hotel is air conditioned; illuminated by continuous rows of recessed, glass-enclosed fluorescent fixtures.*

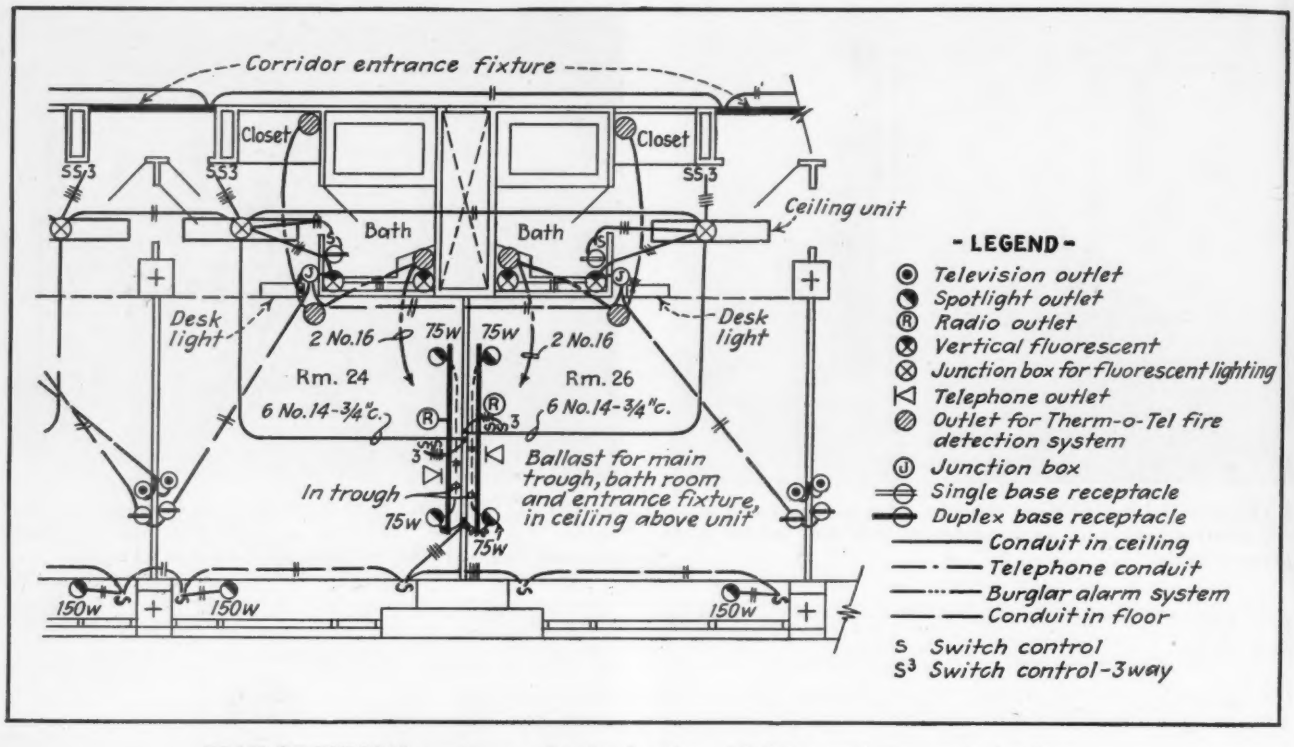
CLOSEUP OF WALL *fixture section showing slimline and reading lamp assembly.*



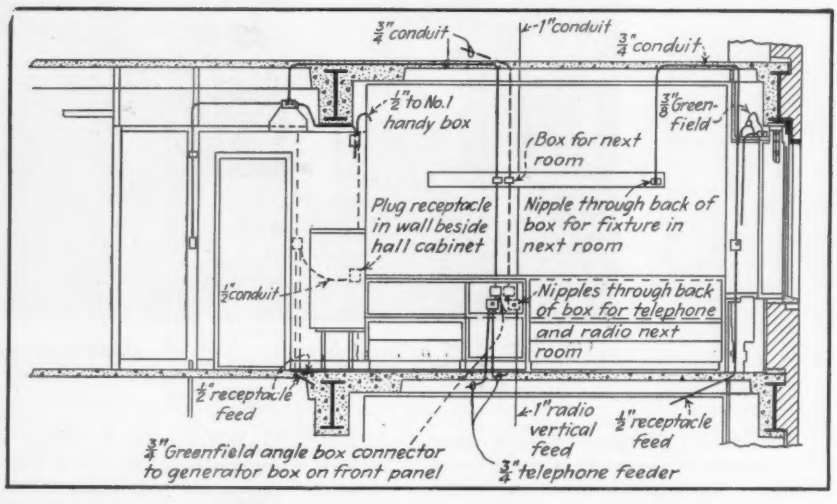
BUILT-IN UNITS *over double guest room entrances have translucent room numbers; illuminate door recess.*

MIRRORED DOORS *on floodlight enclosure swing outward to direct beams down on terrace 150 feet below.*





PLAN OF TYPICAL *guest room showing location of lighting equipment and circuiting.*


¾" conduit
1" conduit
¾" conduit
½" to No.1 handy box
⅜" Greenfield
Box for next room
Plug receptacle in wall beside hall cabinet
Nipple through back of box for fixture in next room
½" conduit
Nipples through back of box for telephone and radio next room
½" receptacle feed
1" radio vertical feed
½" receptacle feed
¾" Greenfield angle box connector to generator box on front panel
¾" telephone feeder

SECTION THROUGH *typical room showing outlet box location for lighting, radio and telephone systems.*

APPROXIMATE FOOTCANDLE INTENSITIES IN HOTEL AREAS

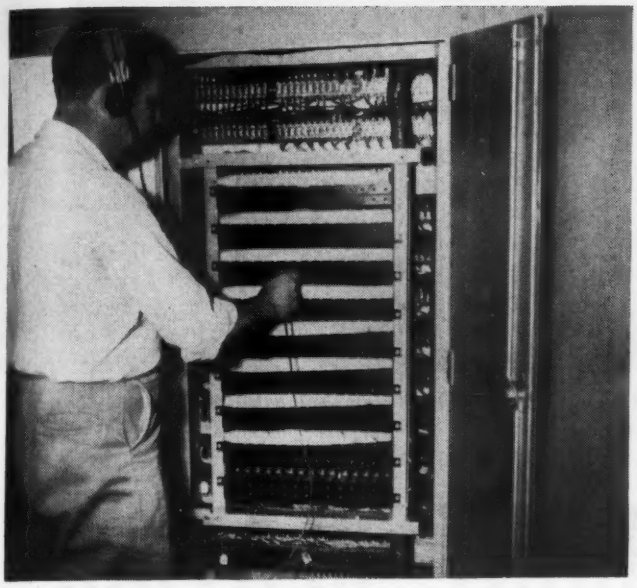
Outdoor Canopy	20-25
Elevator Lobby	20
Main Lobby Lounge	10-15
Registration Desk	80-90
At Elevators	40
Under Door Lights in Corridors	20
Guest Rooms	
In front of Wardrobe Mirror	15
Bathroom Dressing Table	20-30
Wall Fixture only	5-8
Under Bed Reading Lamps	20-25
Under Window Spot at Chair Read-Level	45-50
Roof Terrace at table	30
(All parapet units not on)	

glass shielding. Corridor lighting is provided by special slimline fixtures (with translucent room numbers) built in a set-back for each pair of guest room doors.

Guest rooms provide the ultimate in compact, functional furnishings and specially designed lighting equipment. General direct and indirect room illumination is provided by a long wall fixture with 96-inch slimline lamps mounted over the studio beds. At each end of the fixture and directly over the head of each bed is a built-in, louvered, 75-watt R-30 incandescent flood lamp for reading. Switch control is a recessed, diffusing glass covered fixture with two 3-way switches from the bed and room entrance.

Most spectacular lighting trick was that applied to lighting the outdoor terrace on the eighth floor (cocktail terrace in summer, skating rink in winter for ice shows). Floodlighting is provided by 30 3,000-watt floodlights, assembled in units of three lamps, and mounted on the 19th floor parapet some 150 feet above the terrace. Units are enclosed in parapet "doghouses" equipped with hinged doors on the terrace side. The inside of these motor-operated doors have mirrors that reflect the light downward on the terrace.

Another feature seen in few—if any—other hotels is a private meeting room with a stage lighting installation. Included are gold and white fluorescent wall backlighting, stage ceiling and sidewall floodlighting with 150-watt PAR units in louvered housings.



QUICK TROUBLE SHOOTING *facilities on hotel radio system are provided by this master connection panel.*

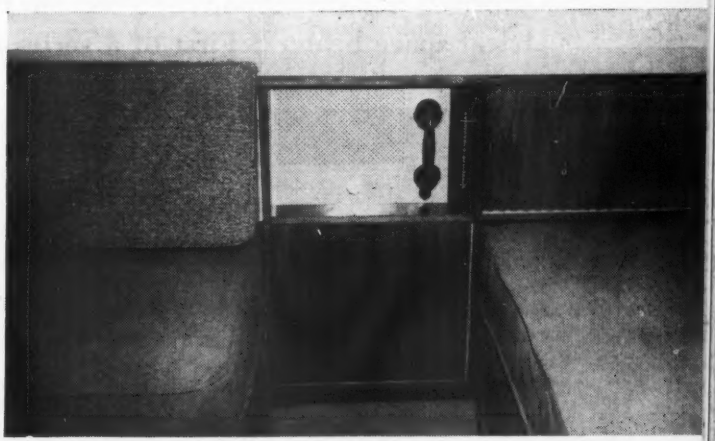
DISAPPEARING WALL *makes a single living area out of two guest rooms.*

Other Systems

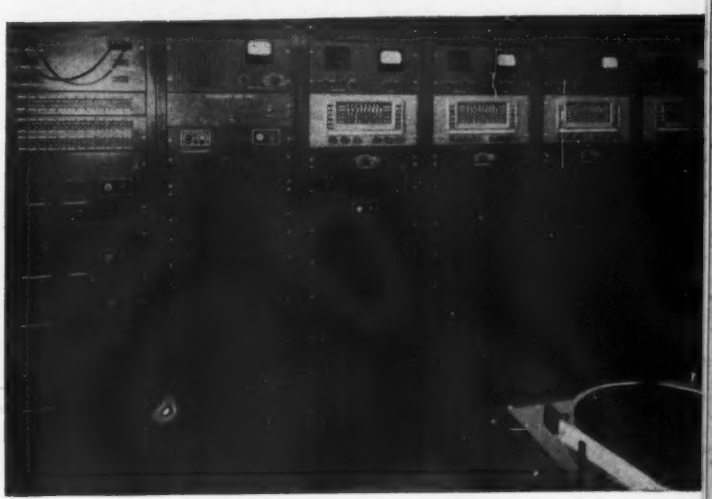
In addition to the normal light and power distribution facilities, separate conduit systems were installed for sprinkler alarm, fire alarm, burglar alarm, radio, television, telephone and master time clock.

Notable among the new features included in this hotel design are the built-in room radio and telephone—all on a single panel installed between beds. Here also, is a three-way switch controlling the wall troffer and a switch controlling the bed lamp. Electrically-operated beds roll in and out of the wall shelf approximately 15 inches to make comfortable divans by day. Switch control is on wall shelf near the radio panel.

Should guests desire two connecting rooms with single-area facilities, a partition between the two rooms can be rolled up. Counterweighted wall panels, made of plywood on steel frames, and operated by two 1/50 hp. motors, disappear into partition recesses on the floor above. Control is from a key switch in the wardrobe closet. A lock switch in the maid's headquarters on the floor must be "on" before closet switches will work. These facilities are provided between two rooms on alternate floors of the hotel.



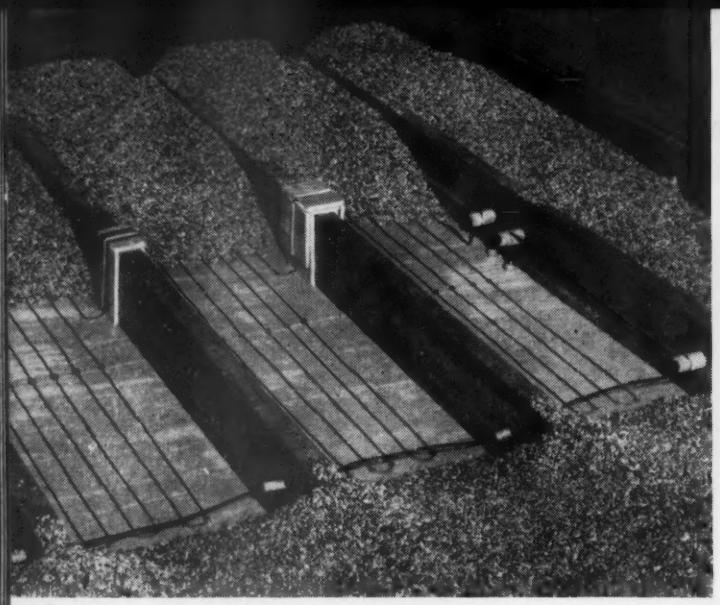
COMBINATION RADIO *and telephone panel is conveniently located between beds in guest rooms.*



RADIO PANEL *has six regular broadcast channels, one emergency channel and two turntables for recorded music.*

ENGINEERING PERSONNEL
TERRACE PLAZA HOTEL BUILDING

OWNER—Thomas Emery's Sons, Inc., Cincinnati, Ohio
ARCHITECTS—Skidmore, Owings & Merrill, New York, N. Y.
CONSULTING ENGINEER—Guy B. Panero, Successor to Clyde R. Place, New York, N. Y.
LIGHTING ENGINEER —A Feder, Lighting by Feder, New York, N. Y.
BUILDER—Frank Messer & Sons, Inc., Cincinnati, Ohio
ELECTRICAL CONTRACTOR—Bertke Electric Co., Inc., Cincinnati, Ohio



CEILING RESISTANCE *wire installation in an existing home. Cable is tacked to plasterboard ceiling.*

HEATSAM CABLE *installed on rock lath ceiling before plastering in a new home. Square ends on runs would be better.*

ELECTRICAL RADIANT HEATING

Methods and practices for designing, installing and wiring resistance type electrical space heaters. First of a series of articles on this new electrical market

ELECTRIC PANEL HEATING *occupies no space, offers individual room control, unlimited furniture arrangement, unparalleled comfort. The switch and thermostat at extreme left are the only visible parts of the heating.*

FLOOR PANEL *is heating cable stapled to insulating concrete, and topping applied.*

FLOOR CABLES *are poured in floor, the ¾ inch pipes are used as screeds, the broom realigns wires displaced in pouring.*

RADIANT electric panel heating comes close to the ideal in physical comfort. **The public wants it.** Hundreds of installations have been made. And demands are far ahead of accurate knowledge of optimism methods and practice.

Power shortage is exercising a restraint which may give the electrical industry a chance to meet and solve many problems in an orderly sequence. It also gives the industry time to acquire a body of essential know-how and experience in the field of heating.

Electric panel heating dates back as far as ten years in the Northwest and much of the available experience with this method of heating is concentrated in this region. A system of buried resistance wires was pioneered by L. N. Roberson, of Seattle. The State of Washington has set up comprehensive rules for installation which will be used as a guide in considering National Electrical Code rules for such installations. And the combination of moderate climate and low electric rates has helped to focus activity in this area.

According to Thomas L. Matney, chief electrical inspector, Department of Labor and Industries, State of Washington, there are from 1000 to 1500 buildings and homes in Washington heated by resistance wires imbedded in floors, walls or ceilings. With only two exceptions all operate satisfactorily.

The Roberson system developed from standardized greenhouses made for homes and commercial nurseries. He pioneered soil heating and soil sterilization and from these developed a thermosetting plastic coated resistance wire made in standard lengths.

Heat circuits of No. 12 are run from the panel to the switch and thermostat box in each area. Raceway or loom is then run to the joist space or to the floor, depending on where the heating elements are to be run. Some installations use an outlet box near floor or ceiling level to terminate the heating wires. Present heating wires, however, include a non-heating lead at each end which can be run to the switch box.

For ceiling installations the heating wires are stapled on the lath. Spacing is determined by a formula: Width of the room minus 1, times length of the room minus 1, times 12, divided by the length of the cable in feet. The length of the cable is determined by the calculated wattage required to heat the room and to take care of the heat losses. Cable is made in various lengths ranging from 175 to 3000 watts. Cable and leads should be kept at least 2 inches clear of metal lath or metal reinforcing to avoid hum.

Where installed in concrete or magnesite floor, each cable end should be encased in Fiberglas sleeving or loom where it enters the raceway to be taken up to the thermostat box. Elements should be tested with bell and battery or line voltage to make sure no breaks have opened the circuit. Neon glow lamps are not recommended for testing as they show a glow at line voltage even though the circuit may be open.

Plaster should be allowed to dry for a week in summer and two weeks in winter, according to Roberson's instructions, before heat is turned on. Then the rooms should be brought up to temperature slowly, at a rate of 4 deg. per day. If the temperature drops below 50 deg. the rooms should be brought up slowly.

Installed in existing houses, the cable can be laid on top of plasterboard or fire-resisting finish but not directly on wood or lath. A sheet of asbestos paper should be used between cable and wood.

Roberson's directions for installation in concrete are as follows: "A frame is first made from scrap lumber for each room. A row of nails is placed at either end and the cable wound and evenly spaced. The electrical contractor should be present when the floor is poured and as the first three inches of concrete are poured and leveled off he places the frame down on the floor. The pouring is continued. When sufficient concrete covers the element and holds it securely, the frame is slipped out and the surface finished."

In an Oakland house, a different method was used. The cable was laid on the rough concrete slab around special hard steel nails designed for driving in concrete. Then the finish coat was poured over it all. Where magnesite flooring is used the underlayment is poured and the element can be stapled to it, then the finish coat poured.

Typical of radiant panel heating costs is a 10,000 cu. ft. frame house with 18.3 kw. connected heating load. One year's consumption for heating alone was 13,710 kwh. at an average cost of somewhat less than 1 cent per kilowatt hour.

Further articles in this series will discuss other methods of panel heating, including Uskon and methods of estimating current requirements.

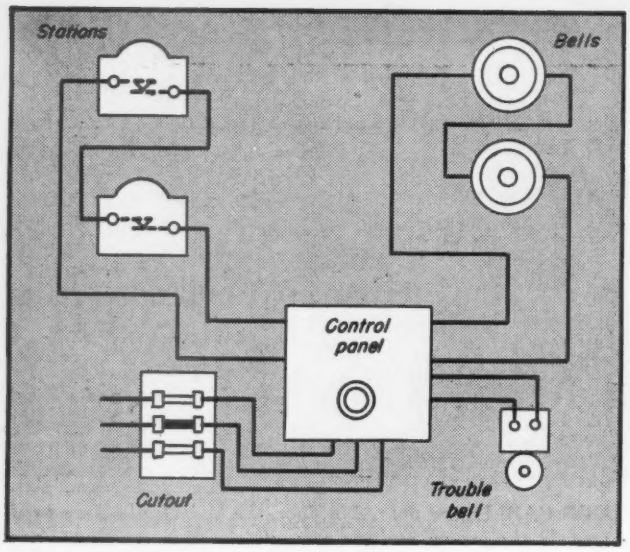


FIG. 1. *Plain code fire alarm system wiring diagram.*

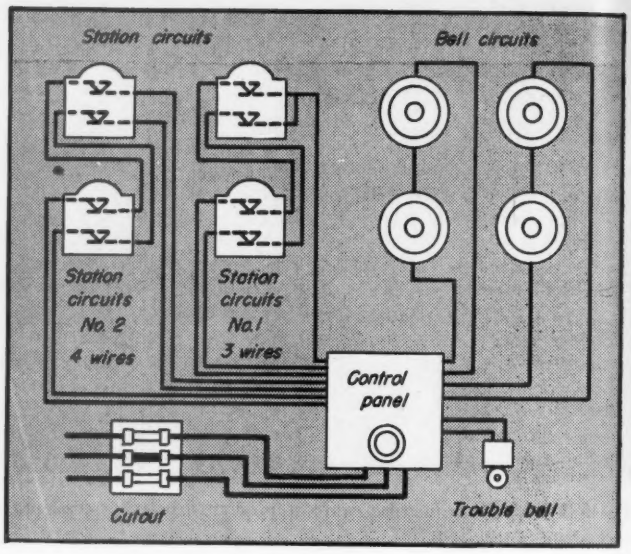


FIG. 3. *Pre-signal fire alarm system wiring diagram.*

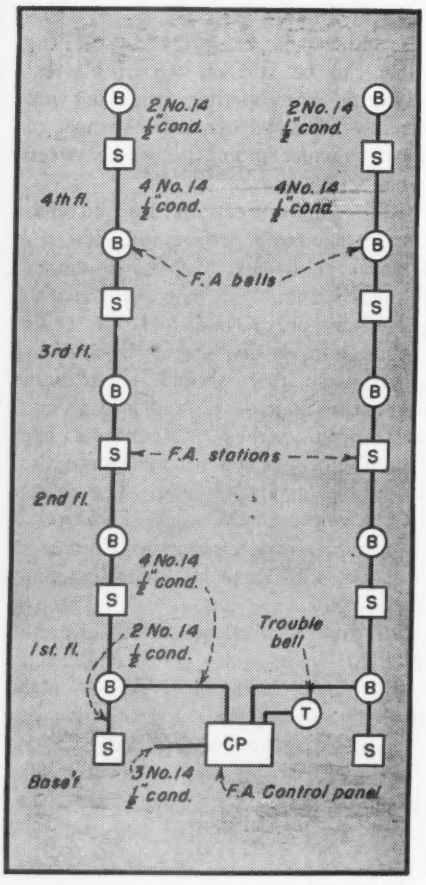


FIG. 2. *Plain code fire alarm system riser diagram layout.*

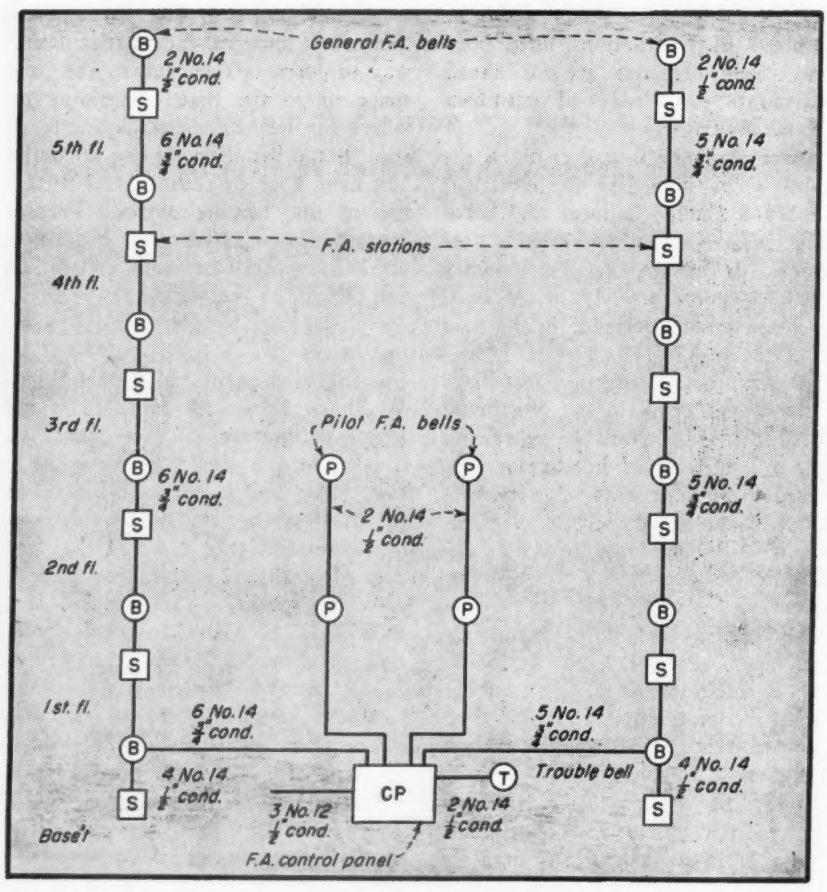


FIG. 4. *Pre-signal fire alarm system riser diagram layout.*

THE planning, designing and the layout of a fire alarm system is largely governed by the construction of the building in which it is to be installed, and by the ordinances and regulations of local communities, cities, states and by the National Board of Fire Underwriters.

In general the chief requirements specify that the alarm stations must be located in the path of escape, that is, near stairways, exits, etc., that persons need not walk more than 100 feet to a station, the audible signals to be located so that they may be heard by the occupants, a limitation on the number of stations and audible signals on a circuit and the type of equipment to be installed in different types of buildings. The maximum number of stations is usually 20 while the maximum number of bells would be ten on alternating and 14 on direct current systems.

In laying out an installation the procedure suggested in previous articles on signal systems should be fol-

FIRE ALARM LAYOUT

Considerations for planning, designing and installing typical fire alarm systems.

By A. A. Schuhler

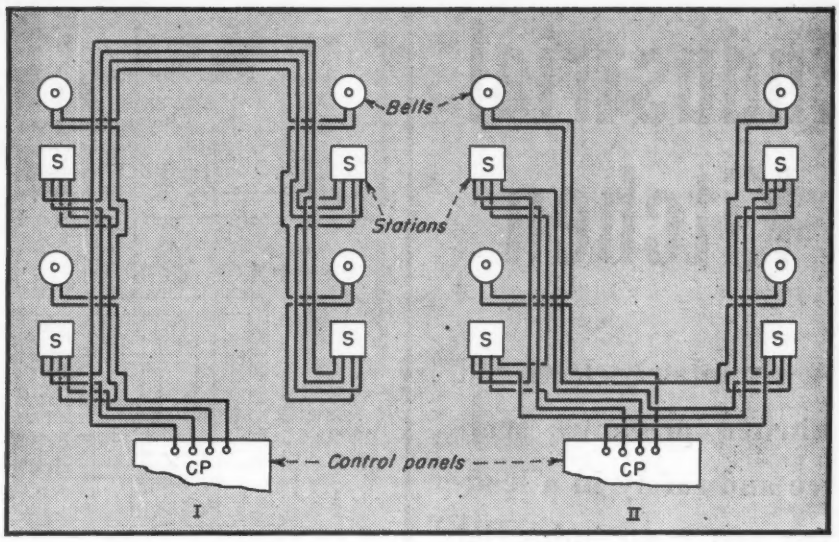


FIG. 5. *Two methods of arranging multiple wire type fire alarm system.*

lowed. This is particularly true of carefully checking the specifications and the manufacturer's wiring diagrams. In addition a complete wiring diagram corresponding to the conduit layout should be fastened to the inner side of the fire alarm control panel door or in a frame adjacent thereto. Such a diagram should indicate a uniform color-code to all terminals throughout the system.

While in the average sized project pull boxes and terminal cabinets are seldom used, they should be used on long runs where there are more than two 90 degree bends, and at points in large installations where the wires enter or leave buildings. Where these cabinets are used terminal strips should be provided and a separate chart mounted therein showing every connection made and their points of origin.

Fire alarm control panels should be arranged so as to provide for future additions to the building. No audible signal circuit should be loaded to capacity. Consideration should also be given to future additions to station circuits.

The question of conduit sizes is one which causes the same problems as that experienced in the design of lighting circuits. While in the majority of cases nothing larger than No. 14 wire is necessary for the fire alarm stations, the sizes vary on the larger installations in regard to the audible signal circuits. As the height of the building is increased the number of wires also increase since there are set limitations as to the number of stations and audible signals permitted on a circuit. It therefore becomes necessary to increase the size of the conductors or to decrease the number of bells on a circuit or both. As a rule the number of bells on the intermediate floors may be decreased to eight while on the upper floors of a tall building this number may be decreased to seven on a circuit.

As a rule backboxes for equipment are generally provided with one-half or three-quarter inch knockouts or threaded bosses. Some fire alarm stations may be provided with one-inch bosses. Where larger sizes of conduits are run use pull boxes and branch out from these to the station or bell backboxes or run additional smaller conduits.

A typical plain code single supervised fire alarm system wiring diagram is shown in Fig. 1. The system functions as follows: Pulling and releasing the lever of any station will cause the code number of that station to be sounded four times on all sounding devices in the system. The trouble bell will sound continuously in the event the operating current is interrupted, or if an open-circuit occurs in the system wiring or connections.

A typical riser diagram layout of a plain code fire alarm system is shown in Fig. 2. It indicates the relative location of all audible signals, stations and the control panel with the quantity and the size of the conductors and the size of the conduit. Since all conductors are as a rule carried through outlets of all equipment, and for the most part are connected to terminals or are looped, pull boxes or terminal cabinets are seldom used. Exceptions to this have been previously stated. The diagram shows two risers which are duplicated. All bells are connected in series on one circuit. All stations are connected in series on one circuit.

The wires used in the system should be color-coded, such as black and white for the audible signals and red and brown for the stations. One of each pair of wires should be used throughout for the actual connections to the terminals in the signals or stations, the other wire in each pair is carried directly from the control panel to the furthest unit in the system.

The plain code fire alarm system may be arranged in other ways. For example a system consisting of two risers of stations, one at each end of a building and one riser of bells in the center of the building. In a building not exceeding ten floors all three lines of conduit terminate at the control panel. The conduit size in each case would be one-half inch. In a system consisting of stations and bells on one riser in a building 15 stories in height it will be necessary to divide the bells into two circuits, and preferably as evenly as possible. In this case one circuit would have eight bells for the first to the eighth floors, while the second circuit would have seven bells for the ninth to the fifteenth floors inclusive. The maximum number of wires between the first and the eighth floors would be six while above that floor there would be a total of four.

A typical pre-signal single supervised fire alarm system wiring diagram is shown in Fig. 3. The system functions as follows: Pulling and releasing the lever of any station will cause the code number of that station to be sounded four times on only the

[Continued on page 144]

Industrial Kitchen

A completely-electrified kitchen promotes service and safety in a leading east coast industrial plant.

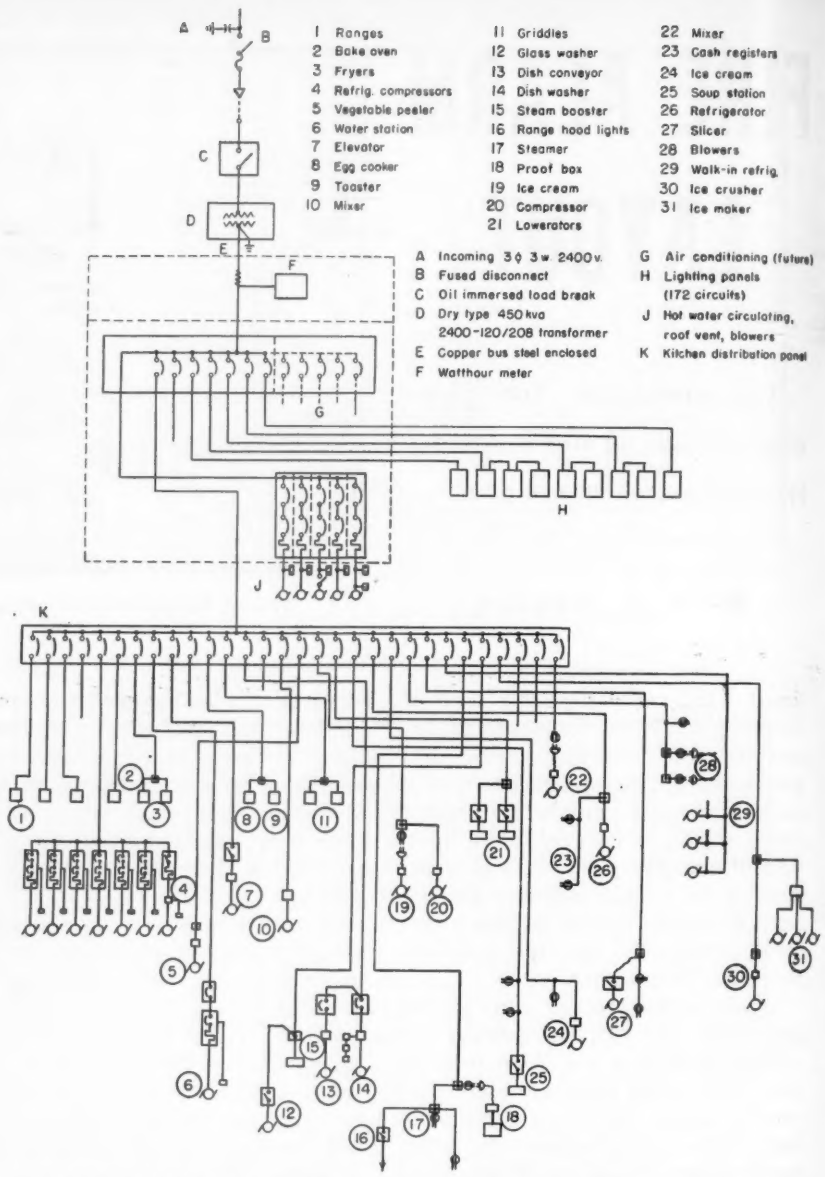
By Hugh P. Scott

COMPLETELY electrical—from underground 2400-volt service entrance to asbestos wiring and vaporproof lighting units beneath range hoods—is the modern kitchen-cafeteria installation in one of Jersey's up-to-the-minute chemical plants. Here, where positive requisites include safety, service and sanitation, electrical operation insures these objectives. And, in the interest of economical efficiency, the installation has more than justified its purpose.

Recognition for the electrical installation goes to A. Neri, Inc., of Hoboken, N. J., while credit for the overall design and construction goes to the Wigton-Abbott Corporation of Plainfield, New Jersey.

Occupying approximately 10,000 square feet on the ground floor of a new reinforced concrete and brick 2-story and basement structure, the cafeteria-kitchen installation can comfortably serve 400 employees at each sitting. And, through the use of a soiled-dish conveyor between cafeteria and dish pantry, lowerators for maintaining stacks of service trays at constant levels, and other modern self-service devices, food-serving and table-clearing intervals are materially decreased although personnel required for these functions is at a minimum.

The remaining 6,000 square feet on the same floor is devoted to receiving, storage, records, washrooms, mechanical apparatus and such electrical equipment as transformers and main switchgear.

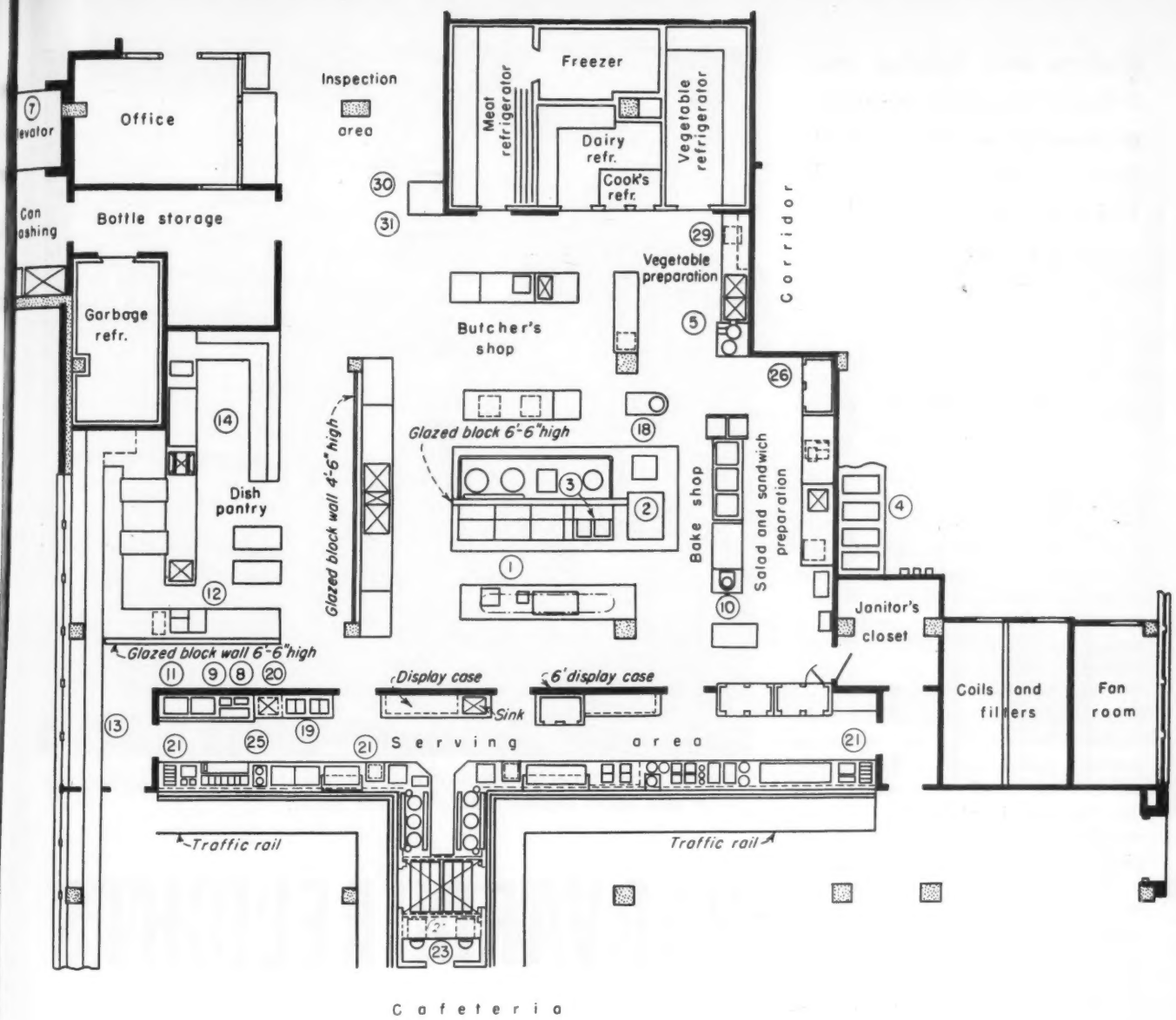


WIRING DIAGRAM *indicates extent of electrical equipment used to promote efficiency, service and control in 10,000-square-foot cafeteria and kitchen.*

Incoming 2400-volt service for the entire building is carried underground to a 3-pole primary load break switch and thence to a 3-phase 450-kva., non-inflammable liquid-filled 2400-208/120-volt delta-wye transformer. Power transmission between this transformer and the main distribution control center is via 250-volt 3-phase 4-wire steel-enclosed bus duct, with bus extension provisions for the future installation of additional air-conditioning control cubicles.

Existing switchgear is contained in dead-front totally-enclosed 10-gage steel enclosures having separate barriers positioned between the metering, motor control and feeder panels. Located in the motor control cubicle are circuit breakers and line starters for hot water circulating pumps, roof vent fans and blowers. Located on the front of the feeder panel are controls for the kitchen power panel and the various lighting panels located in the cafeteria-kitchen area, mechanical room, main plant gate house and the upper floors.

With the kitchen completely electrified, the connected power load in this area totals 150-kva. Contributing to this total are three 21.9-kw. ranges, a 12.6-kw. bake oven, two 7-kw. fryers, two 4-kw. griddles, a 2450-watt toaster, 1200-watt egg cooker and 1000-watt soup station. Other equipments include a 15- and a 7.5-hp. blower, a 5-hp. elevator, and dishwashing machines, water coolers and hot water circulating pumps operated by 2-hp. motors. Although the remaining



SERVICE AREA *separates dining room from space occupied by kitchen, bake shop, dish pantry, butcher section, refrigeration and supervisory rooms. Numerical key is explained in wiring diagram.*

electrical apparatus contributes smaller increments of load, total consumption is sizable due to the extent of the equipment which includes such diverse items as compressors, refrigerating units, ice cream cabinets, ice makers and crushers, mixers, vegetable peelers, proof boxes and glass washers. In addition, numerous flush-mounted 15-amp. 125-volt 3-wire grounded duplex receptacles are located on working tables and in walls for cash registers, clocks and other electrical items. And, since equipment is variously controlled depending upon functional use, manual switches, and thermal, magnetic and timing relays are employed.

In selecting a lighting plan for the cafeteria, average illumination levels were purposely kept within a medium range, for the proposition was advanced that employees could relax more completely during their lunch hour in an atmosphere where lighting intensities were below those advocated for critical seeing in the various research and industrial areas of the plant. The resultant 17 footcandles at table level is pleasingly restful and, at the same time, adequate for comfortable dining.

Fixtures are 4-lamp commercial fluorescent units with eggcrate-louvered panels. Reflecting surfaces are eggshell white, although exterior finishes are satin cadmium. Standard 40-watt white lamps are installed, with high power-factor ballasts and WatchDog starters. Wiring circuits are run in conduit above the 10.5-foot suspended acoustical ceiling level. In all, 27 units are utilized in the 6250-square-foot cafeteria area, resulting in a connected lighting load of 0.7 watts-per-square-foot and a 0.43 utiliaztion coefficient.

Lighting intensities are stepped up considerably over the food counters, however, with a single line of completely-concealed 40-watt fluorescent lamps in a continuous specular reflector located immediately behind and 8-inches above the bottom of the plaster valance separating the cafeteria from the service section. Reflectors are of a slightly modified asymmetrical design so that all light is directed downwards towards the displayed food and, to prevent reflection from the salt-glazed tile partition behind the service areas, baffles are installed on the service side of these continuous strip reflectors. General illumination in this

(Continued on page 184)

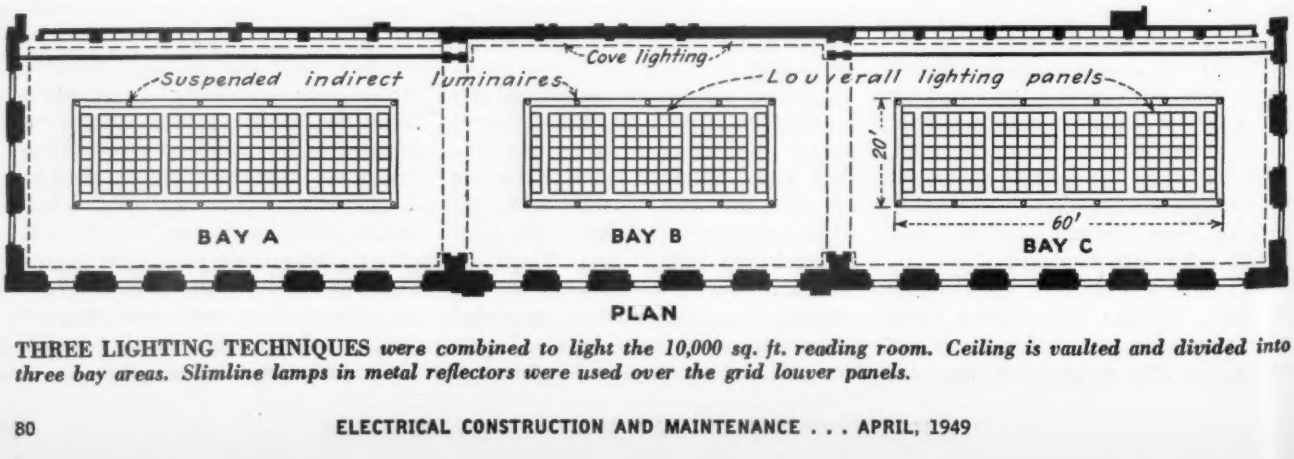
Modern new lighting system provides high intensity of shadowless and glarefree illumination in Harvard University's Baker Library reading room.

ORNAMENTAL IRON FRAMEWORK *of old natural skylight was retained, and former glass panels replaced with grid louver panels.*

HARVARD RELIGHTS

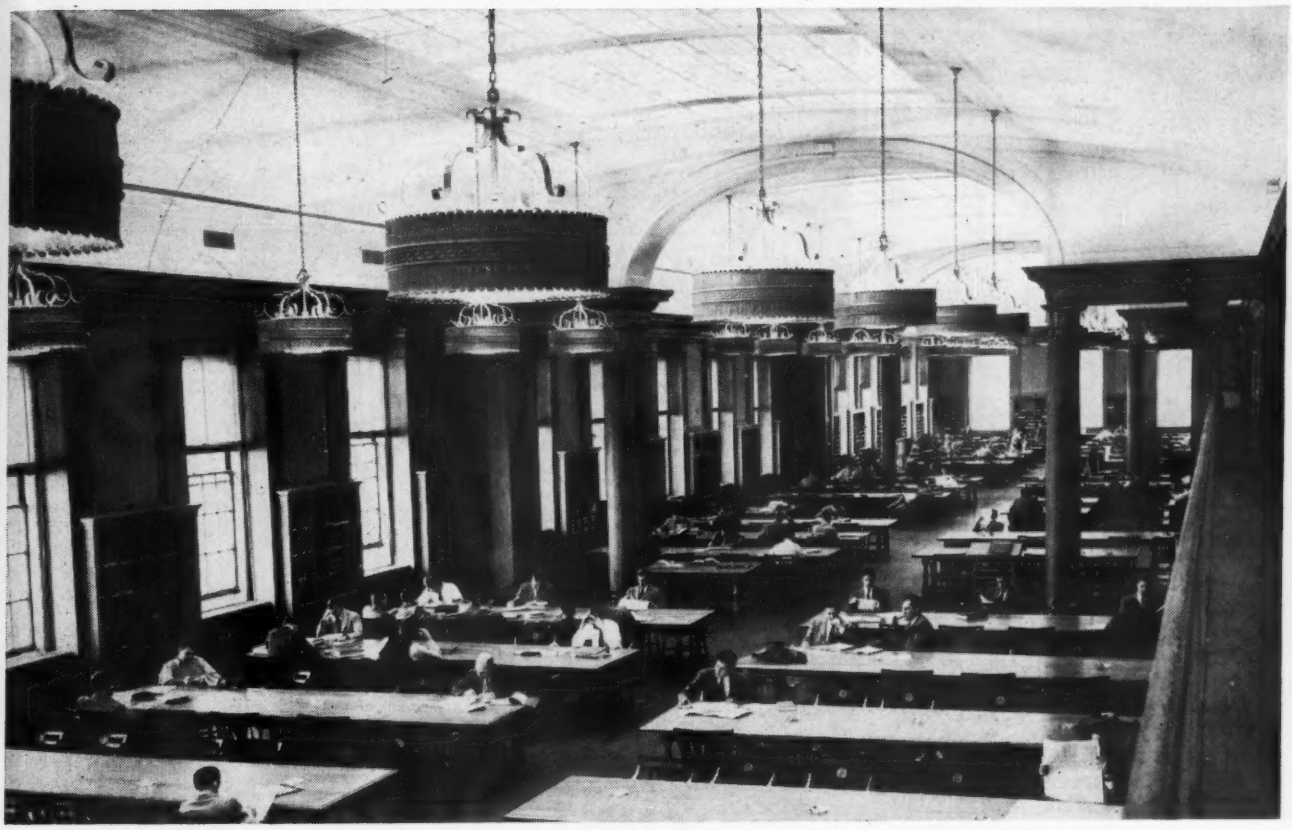
THE pursuit of study by the students of the Business School Group of Harvard University has been made easier by the relighting of the main reading room of one of Harvard's famous buildings, the Baker Library. Situated on the green banks of the Charles River in Allston, Massachusetts, the Baker Library, built some years ago, is an outstanding example of the progress and rapid change that has come in the electrical research world, for this beautiful building has been recently equipped with the most advanced lighting techniques. The new lighting equipment provides a high level of illumination, approximately 45 footcandles, yet this lighting is pleasantly soft and completely lacking in shadows. Of particular importance to the students, is the total absence of annoying reflections from such shiny surfaces as table and desk tops. This non-reflecting feature of the new lighting is a far cry from earlier days when glare caused severe and frequent eye fatigue which interfered with serious study.

The main reading room of the Baker Library is approximately 235 feet long by 44 feet wide and is divided into three equal sections. Each section had a ceiling sash made up of a curved ornamental iron framework panel centered in the vaulted ceiling. Each ceiling sash measures approximately 60 feet by 20 feet and the ornamental iron members are spaced about 26 inches on center. The roof immediately above these ceiling panels was originally skylighted for the purpose of transmitting daylight to the reading room below. With the adoption of the new lighting techniques, the skylights were unnecessary and therefore removed and the slate roof filled in. Each of the 243 sections of the library ceiling light was formerly equipped with a frosted wire glass panel. All of this glass has been removed and a pattern arranged, as shown in the plan drawing, closing off certain openings. The remaining openings were equipped with metal louver panels made up of 3 inch (approximately) size cubes and finished in flat white. There were four differ-



PLAN

THREE LIGHTING TECHNIQUES *were combined to light the 10,000 sq. ft. reading room. Ceiling is vaulted and divided into three bay areas. Slimline lamps in metal reflectors were used over the grid louver panels.*

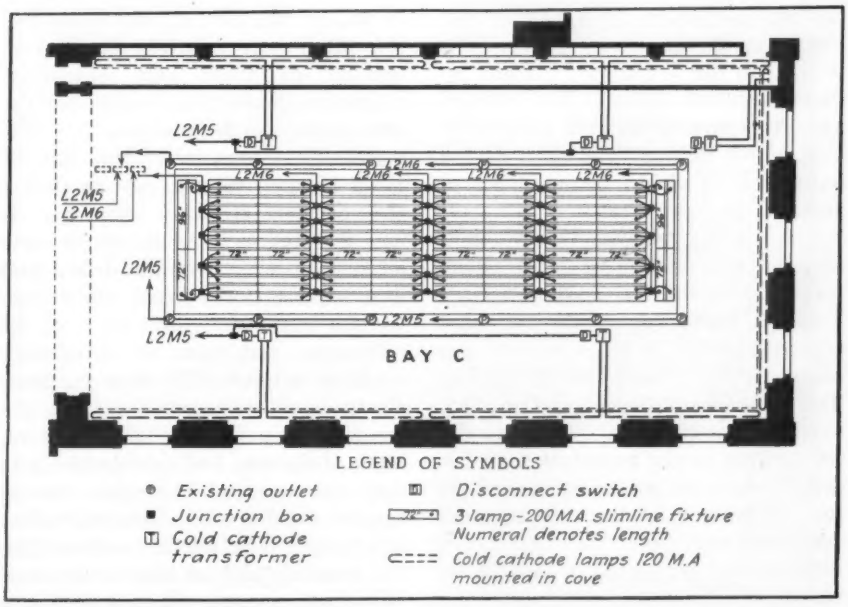


GLAREFREE AND SHADOWLESS LIGHTING *has been provided for Harvard University students in the Baker Library reading room by means of modern new lighting techniques.*

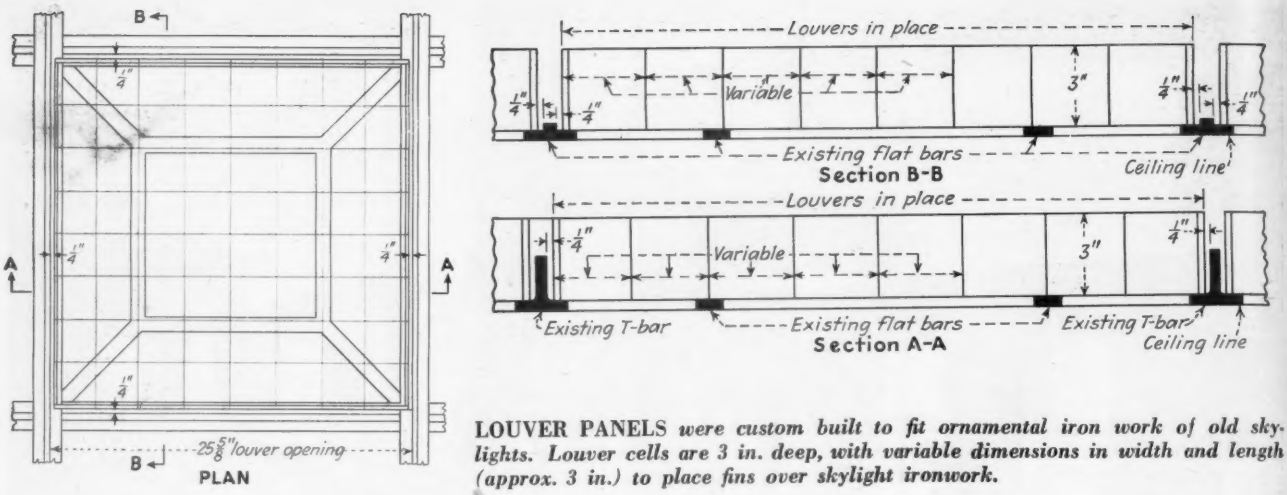
BAKER LIBRARY

By John A. Bernard
Hixon Electric Company
Boston, Mass.

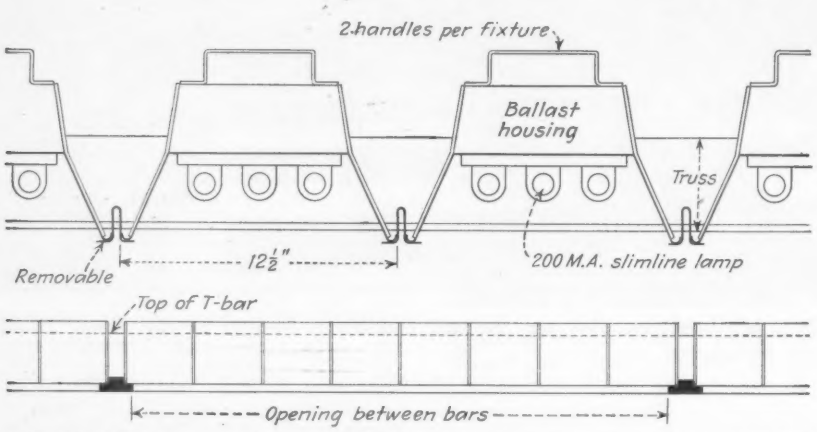
ent sizes of louver panels used as will be discussed later. Immediately above the louvers, adjacent to one another, are located industrial type enamelled reflectors in which 200 MA 3500°, white Slimline lamps are mounted. Each fixture is constructed to accommodate three 200 MA Slimline lamps. The two outside lamps are connected to a two-lamp ballast. A separate ballast is provided for the center lamp. All of these ballasts are of a high power factor type. The inclusion of the two outside lamps is a forward looking feature as, at this time, only the center lamp is being used. This single lamp provides the level of illumination now wanted. However, due to the foresightedness of the lighting engineer, the three-lamp unit has been installed to provide future high light levels if it is found that they are desired. The brick type of ballast was selected for use in the fixtures because of its noiseless operation. Fixtures of various lengths such



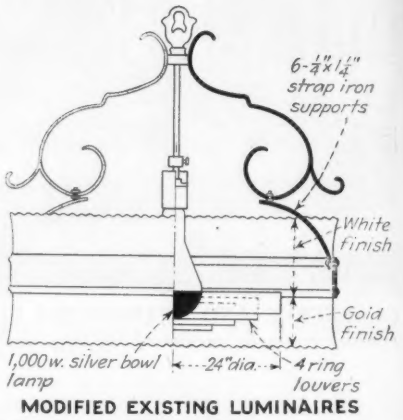
REFLECTORS OVER LOUVERS *were installed edge to edge and follow curvature of ceiling. Two lighting panelboards were provided for each bay, with separate contactor control for each. Louver lighting is on one panel, while cove and pendant luminaires are on other panel, as shown by wiring diagram.*



LOUVER PANELS *were custom built to fit ornamental iron work of old skylights. Louver cells are 3 in. deep, with variable dimensions in width and length (approx. 3 in.) to place fins over skylight ironwork.*



REFLECTORS *form continuous reflecting surface over louvers, and are designed to house three slimline lamps each. Only one lamp per reflector is now in use, permitting later increase in light intensity, if required.*



MODIFIED EXISTING LUMINAIRES

EXISTING LUMINAIRES *of suspension type were modified to accommodate and shield bowl silvered lamps.*

as 64 inches, 72 inches and 96 inches were used in order to fit into the ceiling-opening pattern. The fixtures are supported by special upright brackets secured to the T channels holding up the ornamental ceiling. The fixtures are set to parallel the arch line curvature of the ceiling. The ends of the fixtures were closed off in order to seal off the light areas.

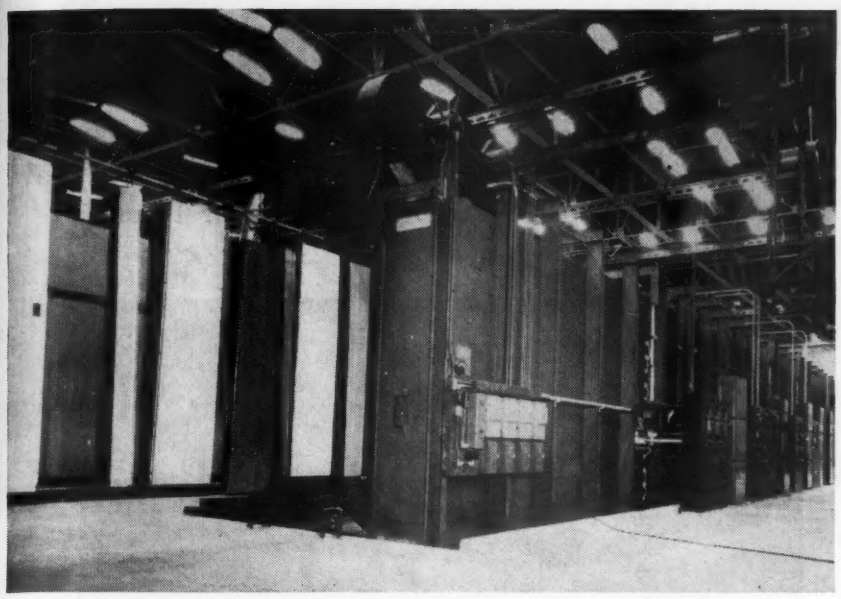
The ceiling louvers were constructed of aluminum and spray painted a flat white and baked at 250°. These louvers were slotted so that each piece could inter-mesh with the other and were banded on the outside, thus providing stiff construction. One of the features of this job was the overcoming of the manufacturing difficulties involved in the making of the louvers because of the fact that the openings were not uniform. Much surprise was registered by all parties concerned when it was discovered that there were six different sized openings in the ornamental iron ceiling panels. Due to the retaining of the ornamental iron work in each opening, it became necessary to design the louvers with multiples of odd dimensions such as 2⅞ in., 3¼ in., 2⅛ in., etc. Considerable study was given to the louvers because of these odd dimensions so as to limit to a minimum the amount of hand processing. It was found that four sizes of louvers could be used to suit the six different ornamental iron openings. It was essential to have the louver strip piece lie exactly over the ornamental iron because if the louver strip piece had not been exactly over the iron, the difference and lack of uniformity would have been visible from the floor. Because of the multiplicity of the many odd dimensions of these louvers, many of the slots had to be hand-cut as they did not lend themselves to the sizes of the dies of the production die-cut slotter. The tolerance allowed to the manufacturer of the louvers was 1/16 inch overall. Each louver was insulated with rubber at the point of contact with the ornamental ceiling iron so as to prevent noise.

Bordering each louvered ceiling bay are twelve large pendant luminaires. In order to retain the architectural beauty of the room, these units were reconditioned and relighted. Each luminaire originally was illuminated with a 500 watt silver bowl lamp and was rebuilt for a 750 watt silver bowl lamp with four-ring concentric louvers to provide shielding.

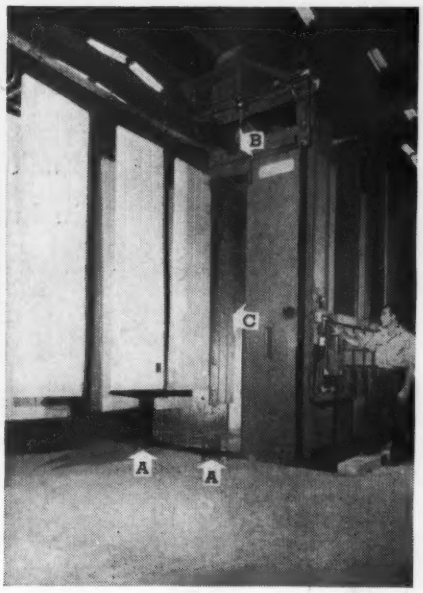
The reading room was designed with a wood cornice above the bookcases and ornamental panelling, about four feet below the spring line of the vaulted ceiling. This cornice is lighted by two parallel rows of warm white, cold cathode, fluorescent lamps, ballast operated. The cold cathode lighting illuminates the walls and the ceiling surrounding the louvered ceiling area. This cove lighting is shielded by a light barrier built on top of the existing cornice in order to shield these lamps from direct view.

The slimline lamp fixtures are wired to junction boxes located on the steel framing, with flexible greenfield extending from the fixture to the junc-

(Continued on page 155)



ELECTRIC FURNACE *in Lustron Corp. plant is 180 feet long with work chambers 11 feet high. Plant has two such furnaces each capable of handling a load of 92,000 lbs. per hour in addition to nine gas and oil fired furnaces.*



EIGHT-FOOT STEEL PANELS *enter Lindberg electric furnace where porcelain enamel is fused on. Reflecting mirrors "A" are part of electronic control which stops conveyor line when ware is improperly hung. Light source for light beam to mirrors is in unit at "B". Typical baffleplate "C" carries traveling thermocouples.*

Lustron Installs Electric Furnaces

Two new Lindberg electric furnaces will speed up porcelain enameling of new Lustron house panels.

ONE of the major engineering achievements in the recently completed Lustron porcelain enameling plant—the largest porcelain enameling plant in the world—has been the design, erection, and provision for control of two 180-foot continuous electric furnaces for fusing porcelain enamel to its base metal. A contract of approximately a half million dollars from Lustron Corporation started Lindberg Engineering Company on a furnace-designing and manufacturing job that was completed in only seven months, an unusually short time for a project of this size.

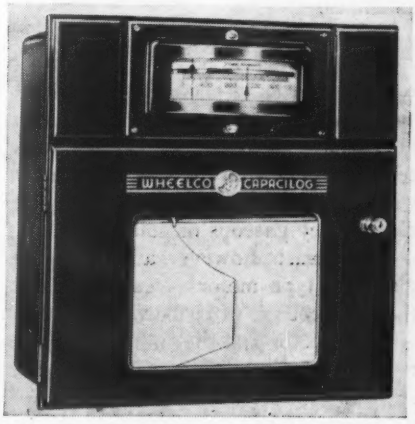
Built to play a leading role in the mass production of Lustron Corporation's all-porcelain enamel factory-built house, the two Lindberg furnaces embody features which are highly unusual, and several of which are completely new.

The Lindberg furnaces are part of a series of 11 Lustron furnaces, the other 9 of which are combination gas and oil fired. The two electric units are 180 feet in length with work chambers 11 ft. high, and each is capable of handling a load of 29,000 pounds per hour (useful work and tools).

Built into a continuous enameling furnace for the first time is an electronic "ware silhouette". In combination with an electric eye arrangement at the furnace entrance, the "silhouette" prevents improperly hung porcelain enameled ware from entering by stopping the conveyor chain automatically, when a light beam is broken. This precautionary measure assures clearance between the piece part and the electric heating elements on the inside of the furnace, preventing damage to both.

[Continued on page 131]

ELECTRICAL TIMING DEVICE *(Wheelco "Inputrol") automatically controls power input to the banks and zone of electric heating elements.*



TEMPERATURES *sensed by continuously traveling thermocouples are automatically recorded by Wheelco "Capacilogs".*

Enclosed Motors Need Drains

Enclosed, fan-cooled motors "breathe". Resultant condensation in humid atmospheres must be drained from motor frames.

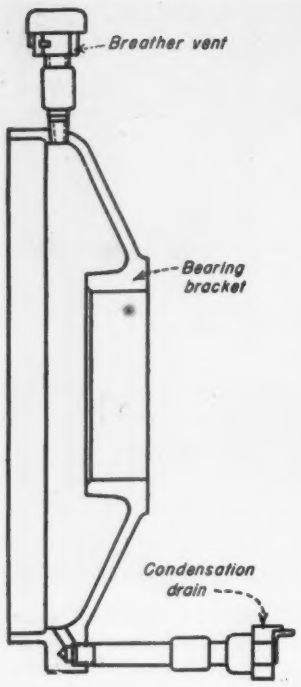


FIG. 1—Section through motor end-bell showing installation of breather vent and drain plug.

By J. M. Hillman

Assistant Manager of Sales and Engineering, Allis-Chalmers Mfg. Co., Norwood, Ohio.

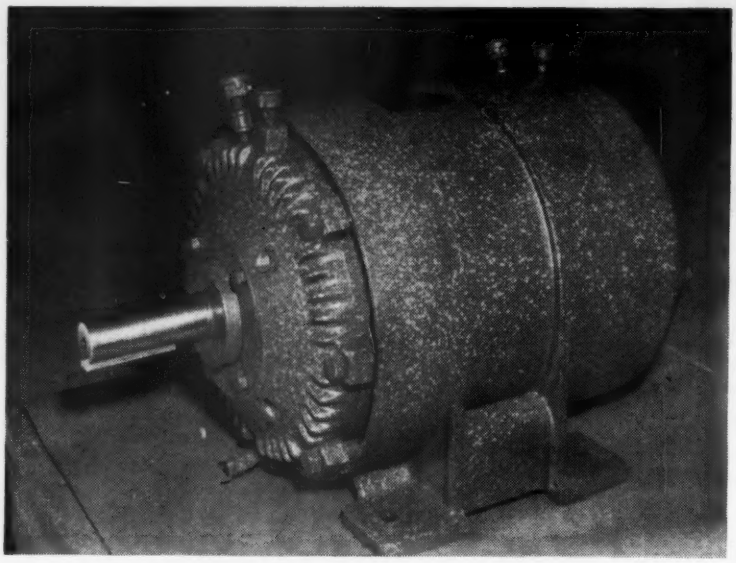


FIG. 2—Enclosed motor with breather vent (top left) and condensation drain at bottom.

THE development of the totally-enclosed, fan-cooled motor can be cited as an outstanding example of progress in the quest for a better motor, one that will last longer, perform with lower maintenance cost, and diminish the operating hazards. Developed commercially in the early 20's it, too, has been continually improved in design and operation. Its popularity is evidenced by the ever-increasing demand for it from some industries which, until recently, used open type machines.

Unquestionably, where atmospheric conditions are unfavorable, the extra cost of the totally enclosed, fan-cooled motor is amortised in a very short time, because the enclosure prevents a concentrated attack on the insulated motor windings by destructive elements in the air, be they gaseous or solid.

There exists, however, an impression that this type motor is gas-tight and that interchange of air between that inside the motor and the surrounding atmosphere is impossible. The error in such an impression is easily proven by an examination of the construction of any typical fan-cooled motor. Furthermore, even the exacting requirements of the Underwriters' specifications for explosion-proof motors recognize an interchange of air, first, by acknowledging that an explosion could occur within the motor (which would not be possible if it were hermetically sealed with unpolluted air at the factory) and second, by requiring that lengths of fits must be such that flame caused by an internal explosion will be cooled sufficiently to confine the explosion to the interior of the motor.

It must be admitted, therefore, that totally-enclosed, fan-cooled motors "breathe". The extent of the interchange of air by this breathing depends on a number of variables, some of which are—length of time between periods of operation, variations in manufacture due to manufacturing tolerances, and temperature variations at location of installation.

This interchange of air by breathing in many cases has no adverse effect on the motor. The enclosure, in any case, is sufficiently tight to exclude dust or other solid matter which may contaminate the atmosphere and also tends to dilute corrosive gases which might also be present.

However, *danger lurks where the motor is installed in a humid atmosphere and does not operate continuously.* While running, the air inside the motor attains a temperature which, despite variations in the ambient temperature, will be maintained above the dew point. Upon shut-down, on the other hand, a sufficient drop in temperature may occur to cause condensation of at least a portion of the moisture contained in the air inside the motor. Repeated occurrences of this nature could result in an accumulation of water in the bottom of the motor sufficient to flood the coils and cause a burnout. Once started, there is little chance for moisture to do anything except accumulate.

There are two methods of guarding against this hazard.

The first is to use space heaters which function automatically through the motor control when shut-down occurs. Thus a temperature higher than dew point will be maintained, regardless of changes in ambient temperature. This method, in addition to its initial cost, creates a continuing operating expense as it consumes power during idle periods, but it is in common use on large motors, particularly in steel mills and in some utilities' plants.

[Continued on page 183]

You save time and money with NATIONAL ELECTRIC

A·B·C. CABLE

The COMPLETE, READY-TO-USE Wiring System

- **ABC is the fastest type of metal-clad wiring system to install.**
- **Easiest to handle . . . Easiest for getting materials on the job.**
- **Wires and raceway are installed together.**
- **One piece from outlet to outlet.**
- **No special tools . . . No waste . . . No threading. . . No coupling . . . No exact measurements.**

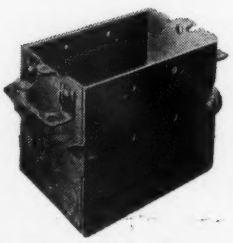
Plus these *extra* ABC features—

Anti-Short Bushing—Protects the wires from armor edges.

"Dilec Safecote" insulated wires—flame retardant, moisture resistant, easy to strip.

2 Paths to Ground on Sizes #14 and #12 (1) The flat grounding strip provides a continuous *low-resistance* path. (2) The armor itself with "bondhook" channel construction also assures a positive path to ground.

ABC IS EASY TO INSTALL WITH "REDEGE" BOXES AND "EZ" CONNECTORS



"Redegé" outlet and device boxes

"EZ" Connectors with sure-grip bondnuts and hinge construction . . . Only *one* screw to tighten . . . Deliveries from stock through leading electrical wholesalers.

EASY TO CARRY
FAST
TO INSTALL

Sold through leading electrical wholesalers

NATIONAL ELECTRIC PRODUCTS
NE
WIRING SYSTEMS
6
WIRES AND CABLES

National Electric

PRODUCTS CORPORATION

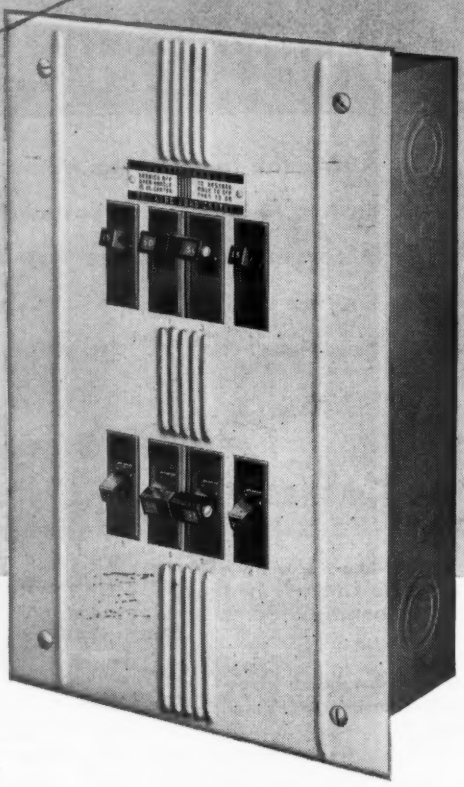
1301 CHAMBER OF COMMERCE BLDG., PITTSBURGH 19, PA.

YOU CAN BE **SURE**.. IF IT'S

Westinghouse

Quicklags CLICK with everyone!

If the lights go out... a flip of the switch restores service. As convenient as that! No fuses to replace... and so simple and safe that even a child can operate it.



and here's why they'll CLICK with you

Everyone is enthusiastic about the new Quicklag Loadcenter. That's because Quicklags add a modern touch of quality to any home . . . combine years of dependable wiring protection with real convenience . . . and make it easy for you to sell a more adequate wiring job to prospects and homeowners.

You stock a few basic devices, breakers of various ratings, flush and surface-type covers. That is all. With this basic equipment you can tailor the Loadcenter to fit the circuit protective requirements of any home . . . and you can do it on the job. The breaker pan lifts completely out to provide plenty of wiring room and the breakers simply snap into place. What's more, the spring-backed breaker pan automatically adjusts the breaker assembly up to the cover.

See the new Quicklag Loadcenter at your nearest Westinghouse supply house, or write for Booklet B-3881. Address Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna. J-60666-A

Westinghouse

QUICKLAG LOADCENTERS

BRIEF ARTICLES about practical methods of installation and maintaining electrical wiring and equipment and up-to-date estimating and office practices. Readers are invited to contribute items from their experience to this department. All articles used will be paid for.

Practical Methods

C. LEE DRYDEN

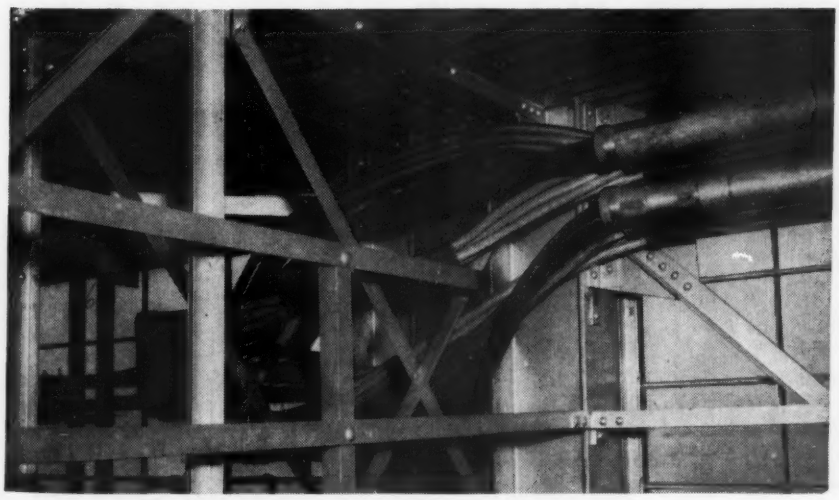
Wisconsin Contractor Takes to the Air

MANAGEMENT

The fact that his construction projects may be scattered far and wide does not prevent C. Lee Dryden, president of Dryden-Harlan Electric Company, Inc., Appleton, Wis., from personally supervising each job. He merely boards his personal plane and is on the spot in a few hours.

Dryden pilots a sleek cabin ship to cover an area embracing the states of Wisconsin, Upper Michigan, Minnesota, the Dakotas, Iowa and points west; makes an average of three trips weekly involving from 12 to 15 hours of flying time. He estimates his travel time is cut more than 50 percent of that required by car or similar transportation. Example: One project is six hours away from the home office by car; one and three-quarter hours by plane.

Dryden-Harlan clients have complimented him and expressed their satisfaction at the close job control he maintains through regular supervisory plane trips.

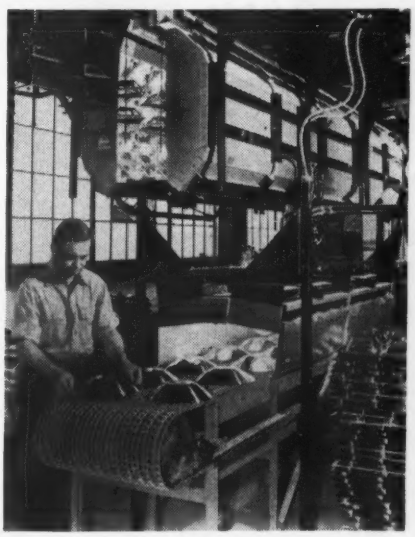


Grouped cables sneak through roof truss barrier at ALCOA's new Davenport plant. The 1,000MCM aluminum, Neoprene jacketed cables leave aluminum conduit raceways at right to feed open wiring circuits on left of truss.

Infrared Ovens Cut Finishing Time

INDUSTRIAL

The drying time for finishing of enameled residential lighting fixtures and gift ware has been reduced to about one-eighth of the time required with former drying methods, in the Cleveland plant of the Phil R. Hinkley Company. This has been accomplished through the installation of two Fostoria Evenray infrared bake ovens. In addition to saving time, this installation has also cut production costs, increased production, and improved the quality of the finished products.



Infrared ovens, one ceiling and the other floor mounted, reduce drying time in finishing operations at Phil R. Hinkley Co., Cleveland, Ohio, manufacturers of residential lighting fixtures and gift ware.

A period of 45 to 60 minutes was required by the previously-used drying oven to do the jobs now done in five to eight minutes. About 75 different sizes and shapes of parts, and a variety of enamel finishes, are handled in these new infrared ovens, requiring a high degree of versatility in the ovens.

Two different types of ovens were selected to take care of these varied requirements; one a horizontal floor type installation, and the other a ceiling mounted installation. Small parts which do not require drying on the

AGAIN MONOWATT SPEEDS JOBS...

NEW COMBINATION DEVICES

Single Pole Switch and Plate
Cat. No. 1321
Three Way Switch and Plate
Cat. No. 1323

Triple Outlet and Plate
Cat. No. 1223

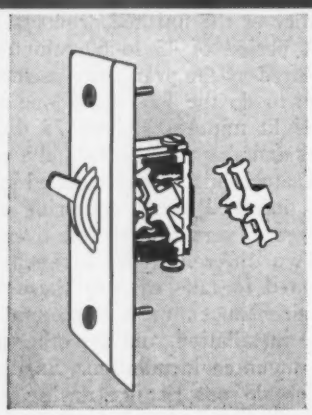
In Brown and in Ivory

LOOK HOW THEY WORK!

They combine in one installation unit both device and plate!

Compare the advantages of this with installing plates and devices separately.

LOOK AT THEIR FEATURES!



THE SWITCHES
"T" Rated to Last Longer

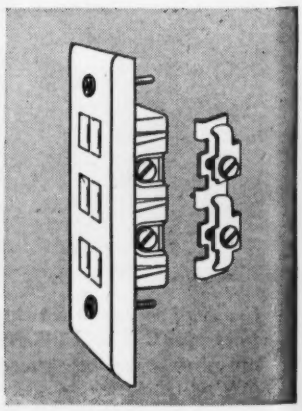
1. Double contacts handle the load better.
2. Special kick-off makes positive mechanical action certain.
3. Arc snuffers smother the arc at each of the double contacts.
4. Trigger guard molded on plate protects the trigger.

THE PLATES
New Features to make Your Job Easier

1. Plate mounts complete device flush.
2. Screws already in place for quick mounting.
3. Oval screw holes for quick squaring.
4. Plate breaks off for ganging.

THE OUTLET
Built for Extra Service

1. Three outlets—not just two.
2. Double contacts of heavy spring bronze grip both sides of plug blades securely.
3. Four large terminal screws—take No. 10 wire.



STEPS UP YOUR PROFITS!

LOOK WHAT THEY DO FOR YOU!

COST LESS TO BUY Buy complete units instead of separate devices and plates. You save about one-fourth the cost of separate devices of equal quality . . . you get three outlets at less than the cost of two.

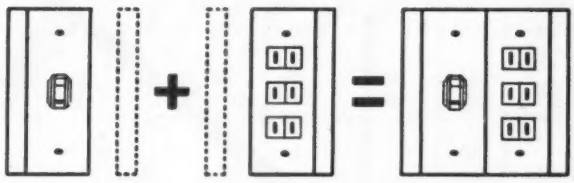
COST LESS TO INSTALL

1. Just two screws mount the complete unit. No separate plate to mount.
2. No adjustments needed. Combining plate with device makes flush mounting automatic.
3. Oval screw holes give you ample leeway for squaring.

GIVE A BETTER JOB

1. Always flush; easily squared.
2. Smart modern design.
3. One piece assembly eliminates dust catching space between device and plate.

GANG TO ANY COMBINATION



Two . . . three . . . four . . . any number, any combination. Use the exclusive Monowatt BREAK-OFF feature to gang as needed on the job.

THEY'RE TYPICAL OF THE MONOWATT LINE

You'll find that other Monowatt products are designed to give you better wiring at lower cost. Why not look into it? Ask your Graybar salesman to show you the whole Monowatt line.

Distributed by GRAYBAR ELECTRIC COMPANY

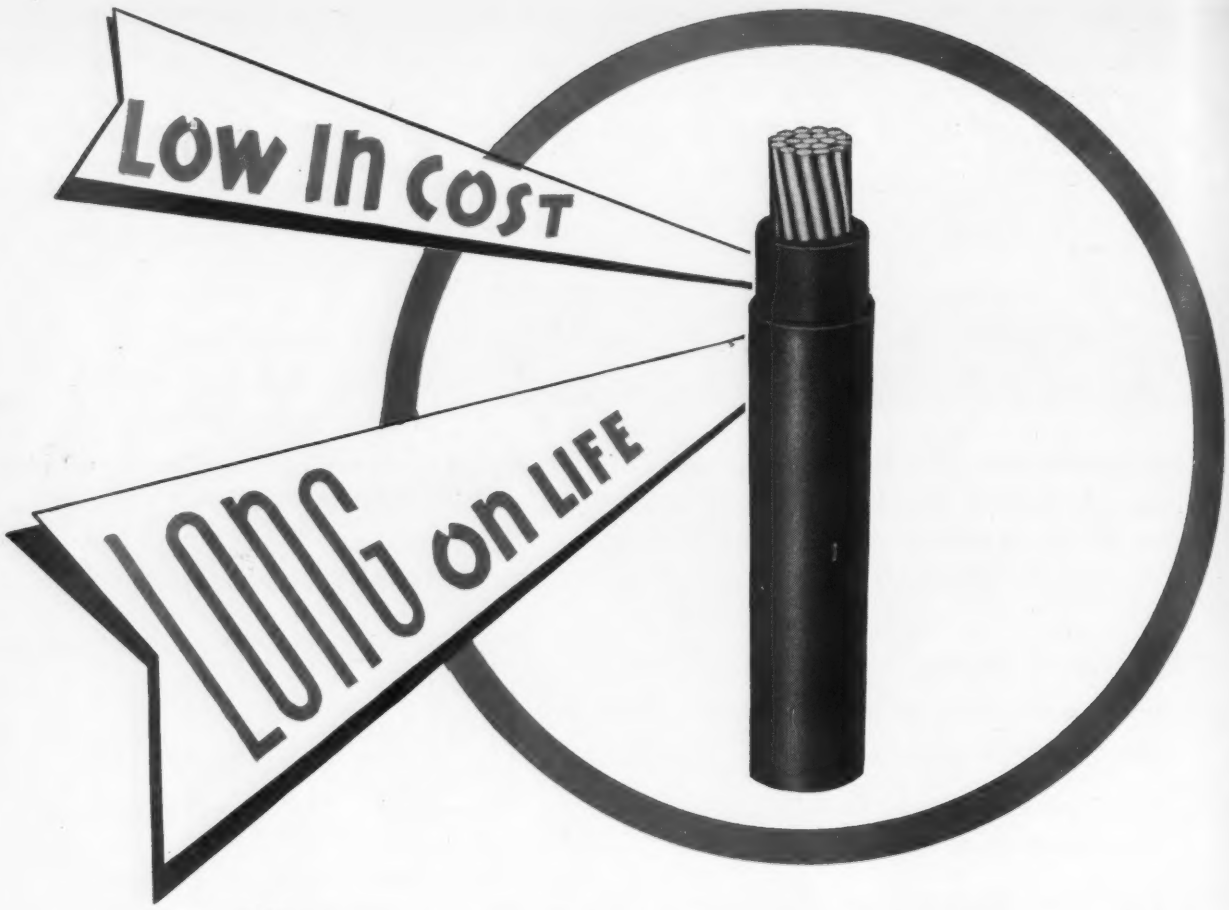
GRAYBAR QUALITY SINCE 1869 REG U S PAT OFF

STOCKS IN MORE THAN 100 PRINCIPAL CITIES

MONOWATT INCORPORATED

A General Electric Affiliate

PROVIDENCE, R. I.



Low in cost, long on life. That's the simple story of ANHYDROPRENE Wires. And those are the reasons why it pays to remember ANHYDROPRENE whenever you're planning new transmission and distribution systems, or are preparing to rewire those already in use.

ANHYDROPRENE Wires consist only of conductor, the famous Anhydrex insulation, and a thin, but tough, neoprene jacket. On some of the large sizes a tape is inserted between insulation and jacket. This simple construction establishes low purchase cost and produces a small-diameter, lightweight wire that's inexpensive to install.

ANHYDROPRENE construction also provides sound electrical and physical properties. There's the low water absorption and high dielectric strength of Anhydrex insulation. There's the resistance to abrasion, acids, corrosive chemicals, heat, light and flame of the neoprene jacket. At 8000 volts and under, ANHYDROPRENE Wires can be operated at copper temperatures as high as 75°C. These features assure trouble-free service year after year, even under unfavorable conditions. And long, trouble-free service means low installation costs and infrequent replacements.

ANHYDROPRENE Wires can be racked on walls and installed underground in ducts. You'll find them especially dependable for plant and shop wiring; for instrument wiring; as underground primaries, transformer leads, and pole line risers; and in signal and control circuits.

Simplex

WIRES & CABLES

SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.

bottom side are dried in the horizontal oven. Larger parts, and those that require drying on all sides, are baked in the overhead oven.

On the horizontal floor mounted oven a plenum chamber runs the full length of the oven. A single row of 16-500 watt infrared lamps and reflectors is located on each side of this chamber.

The overhead ceiling mounted oven is equipped with 224 lamps, 250 watts each. There are eight lamps in the cross section, four on each side, and the oven is 28 lamps in length.

Seven different colors of enamel are used on the products processed in this plant. Since each color absorbs and reflects a different amount of infrared radiation, each color requires a different drying treatment. Flexibility has been achieved through conveyor speed, so that it is now possible to dry clear enamel on a polished brass surface, one of the toughest of finishing problems. This is accomplished by reducing the conveyor speed to the slowest speed available and using the maximum number of lamps.

Before installing the infrared ovens, lacquer was used on some of the parts to keep production moving as rapidly as possible, and to prevent parts from piling up in front of the furnaces. Now enamel is used on all parts, the drying bottleneck has been completely eliminated, and the quality of the finished products greatly improved.

Area Control Of Plant Lighting

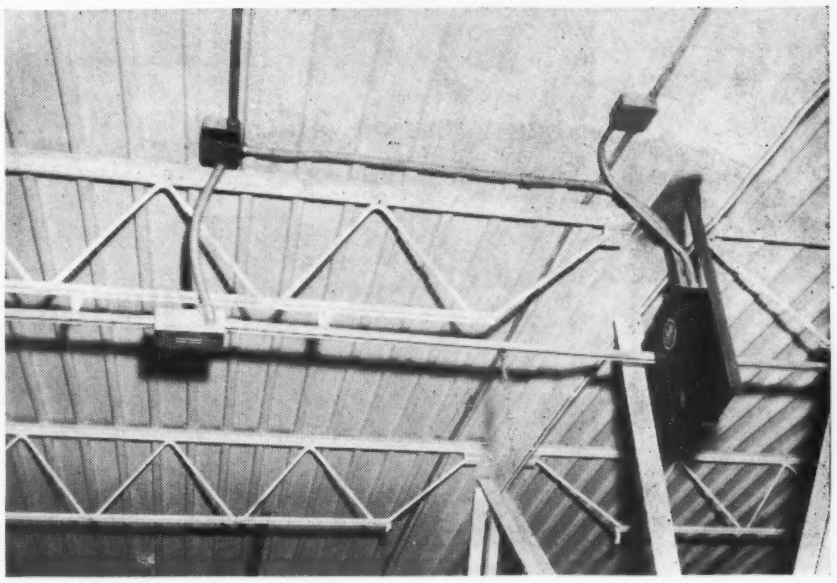
WIRING

Two dozen 3-way switches control a total of 348 cold cathode fixtures (four 8-ft tubes per unit) comprising the general lighting at the new Cambridge, Ohio plant of the Kingston-Conley Electric Company, Division of the Hoover Company. Designed by Fred D. Jacobs, Coshocton, Ohio architect and installed by the Gustav Hirsch Organization, Inc., Columbus electrical contractors, the lighting system utilizes magnetic contactors to provide sectionalized area control.

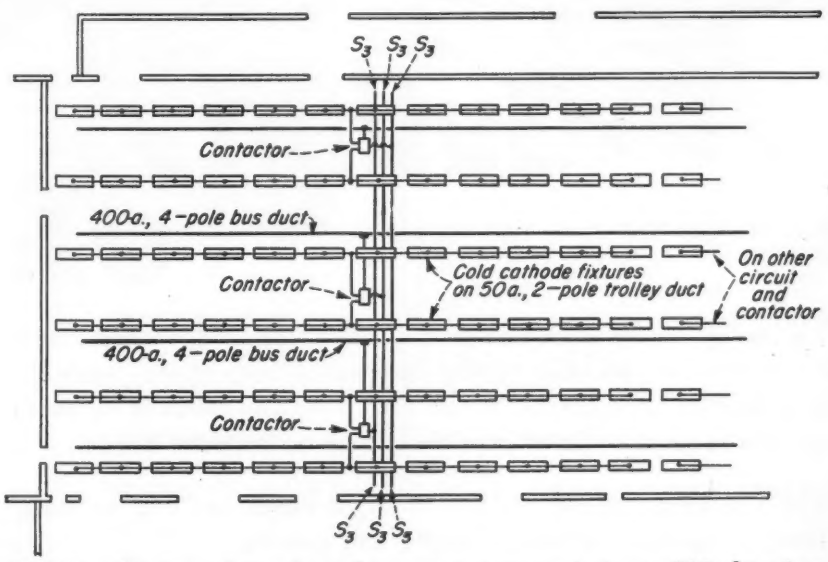
The basic design specifying trolley duct runs for fixture suspension was a "natural" for remote group control. An added innovation is a pair of 3-way toggle switches to operate each magnetic contactor. Located on opposite walls of the long building (634 ft. by 114-ft.), they provide area control from either side.

In the main manufacturing area, ten 580-ft. rows of 50 ampere trolley duct (on 14-ft. centers) are mounted to the bottom bars of the steel bar roof joists. Cold cathode fixtures are chain suspended from the duct on 10-ft. centers (2 feet between fixtures) and connected by individually fused flexible cord plugs (standard accessories).

Lines of trolley duct are fed from parallel runs of power bus duct (400 amp., 4-pole, 120/208-v) through a magnetic contactor bracket-mounted to the steel roof truss. In general, one contactor feeds two lines of trolley duct, each with 13 fixtures. In some areas the pattern varies and as many as 36 fixtures on six parallel duct lines are controlled by a single contactor. In all cases each contactor is operated by a pair of 3-way switches installed on opposite building walls.



This magnetic contactor controls 26 cold cathode fluorescent fixtures on two trolley duct circuits; is operated by a pair of 3-way switches on opposite walls of the plant.



Lighting diagram shows how three contactors control one-fifth of plant general lighting. Nine contactors serve rest of plant. Three-way switches operating contactors add to system flexibility.

Special Hanger Supports Fiber Conduit

DISTRIBUTION

Fiber ducts of various diameters are used extensively throughout the Harrisburg Steel Corporation plant in Harrisburg, Pennsylvania, to carry 2300-volt cables for the high-voltage distribution system. And, to properly suspend these fiber duct runs, which have diameters varying from 5-inches down to 3-inches, hangers and hanger collars were specially designed by Engineers Ford, Bacon and Davis, Inc.

Collars and hangers are constructed from 1-by-1¼-inch black steel. Collars are welded top, bottom, or both, to

have a cigar, partner—

AND MEET THE NEW "JUNIOR" OF OUR FAMILY:

Guthlite Jr.

He's a chip off the old block, all right...the same "radiant glow" appearance and fine **precision-planned** lighting performance that's already made the original **Guthlite*** so successful. In fact, "JR." is the livin' image of his daddy except that he sports a "junior" price tag and has no "Jacknife" Hinge.

Instead, you merely release two little hooks on **either** side and the louver assembly swings down for easy relamping and cleaning.

Guthlite* JR. comes in both **2-40W and 2-85W sizes.** For complete details, request our new Pocket Catalog **46A-A.** Where you need a **proved** performer at a popular price, you can really cash in on this husky, handsome youngster ...take it from

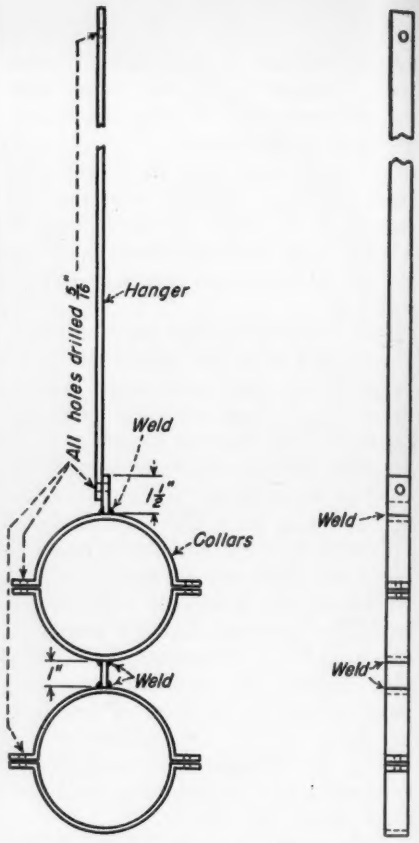
YOUR TEAMMATE IN *precision-planned* LIGHTING

Guth LIGHTING

THE EDWIN F. GUTH COMPANY / ST. LOUIS 3, MISSOURI

Leaders in Lighting Since 1902

*® 720



Black steel collars, held together by bolts passing through longitudinal flanges, and fastened to hangers by means of welded connecting stubs, are used extensively by the Harrisburg Steel Corporation to support runs of fiber duct carrying high-voltage cables.

separation straps between ducts and to stubs for connecting collars to hangers. Horizontal flanges of collars, connection stubs, and the tops of hangers are drilled with 5/16-inch holes to receive threaded bolts. When installing the duct distribution system, hangers of the desired length were first bolted into their overhead positions and then the ducts, with collars loosely bolted into place, were raised and connected to the hangers. Final adjustments were made after the entire duct run was in position.

As illustrated, several series of fiber ducts were suspended from the same hangers and, by using the type of collar discussed, installation of ducts was rapid, secure and trim in appearance.

Wiring for Telephones

WIRING

In building a new office building, it is always difficult to foresee the use that will be made of all areas in the building, and to provide for all service facilities that will be required for all areas. It therefore becomes necessary to provide many facilities at a later

WITH FEEDRAIL *in* ELECTRICAL TROUBLES *are out!*

Shut-downs due to faulty wiring and connectors disappear when the totally enclosed Electric Feedrail Distribution System is installed. You don't have to wait even for rewiring when you relocate electrical equipment in your plant.

Hand tools on the production line are connected to the Feedrail trolley in a jiffy and the problem of moving test lines, bench-work, and moveable lights, is solved for all time.

Feedrail is approved by the Underwriters' Laboratories Inc., and endorsed by leading mechanical, electrical and industrial engineers. Can be installed by your electrician or contractor in a few days.

Ask for the New Feedrail Catalog No. 20—thirty-two pages—more than 100 illustrations—layout diagrams and specification data. Write for yours to-day.

24

ELECTRIC FEEDRAIL

FEEDRAIL CORPORATION

Subsidiary of Russell & Stoll Company, Inc.

125 BARCLAY STREET • NEW YORK 7, N. Y.

Check 3-Phase Connections *this Quick, Positive Way . . .*

KNOPP Phase Sequence Indicator *is* . . .

Reliable— Nothing to Adjust for Reading

Now you can save time in checking poly-phase connections and be sure they're RIGHT when you use the Knopp Phase Sequence Indicator.

Just clip it on, push the safety button and determine beyond a doubt whether the phase sequence is A-B-C; or C-B-A. This dependable Knopp Phase Sequence Indicator shows phase sequence by direction of disc rotation rather than by lamps. Gives correct indication regardless of voltage or circuit conditions without changing taps or dials. It does protect equipment and assures properly connected poly-phase wiring; 50 to 500 volts, 3 phase, 3 wire, 25-60 cycles.

Well-Built, Foolproof

It stands up under rough field use and gives accurate and reliable service. It is made by Electrical Facilities Inc., technical electric equipment manufacturers of 21 years experience. *This* indicator has a *laminated* bakelite housing and no exposed metal parts. It is built for *complete* safety. Fully insulated clips can remain attached between tests as safety push button permits indication only when needed. Weighing but 21 oz., the Knopp Phase Sequence Indicator is small and easy to carry. Price $25; with leather carrying case, $30. Order today or write for complete description.

ELECTRICAL FACILITIES INC.

4232 Holden Street Oakland 8, Calif.

Surfaceduct steel raceway was installed on wall to provide supplemental telephone wiring for 100 pairs of telephone wires in office space leased by U. S. Army Engineers in Portland, Oregon.

date, even in new buildings, when the building spaces are finally assigned.

This was the case in the new office building of "The Oregonian", Portland's outstanding newspaper. It was finally decided to lease to the U. S. Army Engineers for office use an area that had been reserved for a cafeteria. This change in assignment of space posed the problem of installing supplemental telephone wiring not provided for in the original building plans.

W. R. Grasle Co., Portland electrical contractors, came up with the solution. They proposed the installation of Surfaceduct, a steel raceway made by National Electrical Products Corp., to be installed on the wall surface, and painted to match the wall. This method of servicing supplemental telephone wiring in this new building was endorsed by the Pacific Telephone & Telegraph Co., as it considerably simplified their work.

The steel raceway was run in two directions from the main panel, to branch panels out at left and right on the wall. The main telephone conduit carried 100 pairs of telephone wires, with 50 pairs feeding out through the raceway to each of the two branch panels.

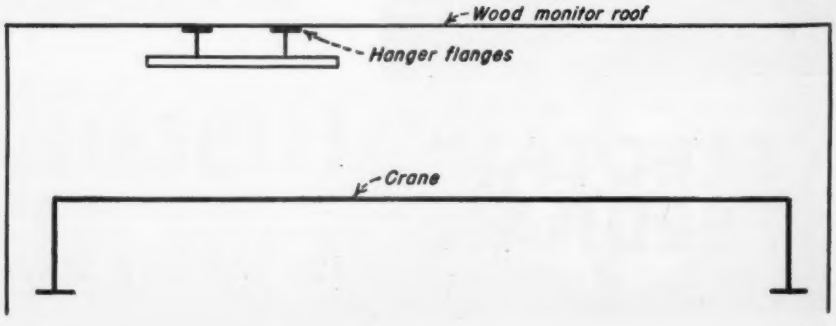
Impact Tool Saves Many Man Hours

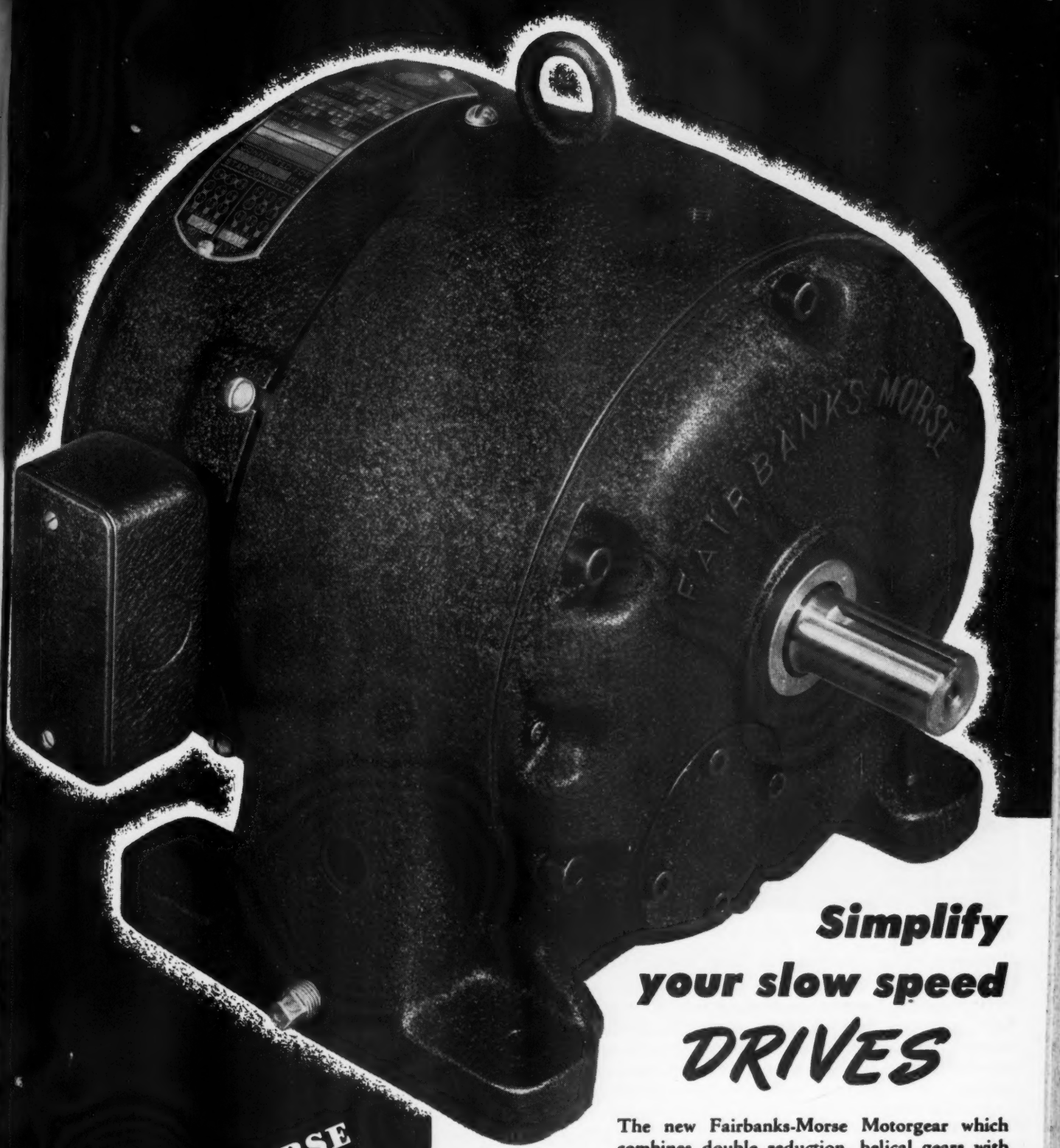
TOOLS

William E. Boyd of the Pacific Electric Motor Co., Oakland, Calif. reports that they saved a great many man-hours of labor in a recent fixture hanging job by utilizing an Ingersoll-Rand electric impact tool with screwdriver attachment, known as Size 4U.

The fixtures, 1400 in number, were hung in the new plant of the General Electric Co. in Oakland, known as the East 14th St. plant. The fixtures were hung from the roof and two screws were required per hanger flange. Working in an awkward position, it would have been a slow, tedious job to bore holes for starting the screws and then drawing them up with an ordinary screwdriver. This comparatively new tool makes easy work of it, starting and driving the screws home in a matter of seconds, with no hole boring. The tool cost around $50, and was well worth it on the one job, but they find it so useful for general purposes that they have purchased a second.

Fixtures were hung from the roof





FAIRBANKS-MORSE

motorgear

Simplify your slow speed DRIVES

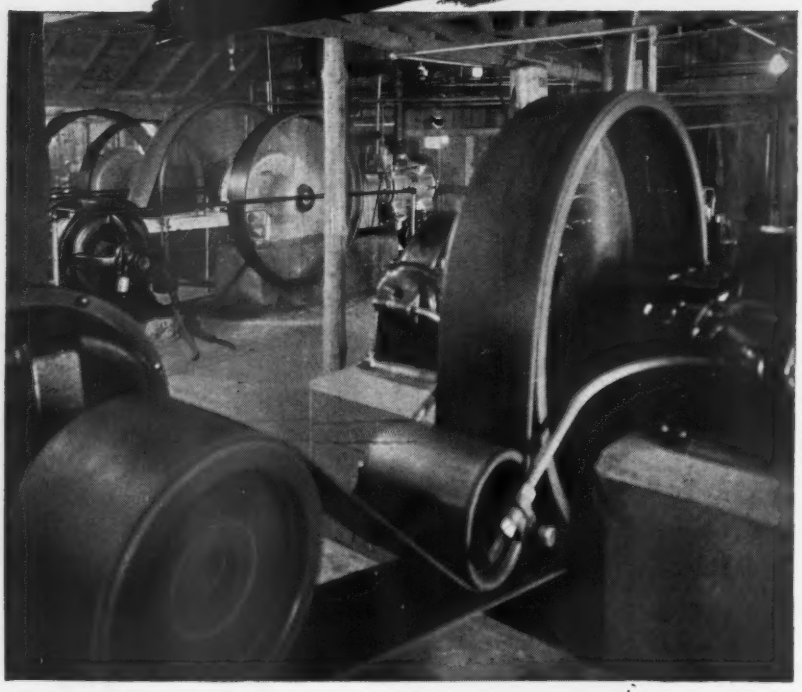
The new Fairbanks-Morse Motorgear which combines double reduction, helical gears with the well-known Axial Air Gap Motor *is a complete slow speed unit — more compact than the average electric motor alone!* Wherever you are using a slow-speed drive in standard ratios up to and including 10 h.p., the Motorgear will save space and weight, minimize servicing and improve the appearance of the driven unit. Send for a Motorgear bulletin. Fairbanks, Morse & Co., Chicago 5, Illinois.

FAIRBANKS-MORSE

A name worth remembering

DIESEL LOCOMOTIVES • DIESEL ENGINES • PUMPS • SCALES • MOTORS • GENERATORS
STOKERS • RAILROAD MOTOR CARS and STANDPIPES • FARM EQUIPMENT • MAGNETOS

CUT TOMORROW'S SHUTDOWNS, TODAY



Whenever wiring jobs come up, think beyond today's wiring needs—think in terms of cutting costly shutdowns—think in terms of maintenance-saving, time-saving Deltabeston* wires and cables. Make it a habit, wherever heat's a threat, to specify Deltabeston throughout, because Deltabeston wires and cables are made specifically to combat the effects of heat, moisture, and corrosive vapors; they give electrical systems protection from immediate hazards, and an extra margin of protection to cover future, unanticipated needs.

So whether you're rewiring an existing system or installing a system in new construction, don't overlook heat-beating Deltabeston. The Deltabeston line includes standards and "specials" for every combination of heat, moisture, corrosive vapor, or other conditions—for temperatures up to 200 C. It gives the system extra protection both on hot jobs and on ordinary installations. And, men who know your problems stand back of your Deltabeston supply source ready to advise you on selection.

For full information on Deltabeston, write to Section Y26-418, Construction Materials Department, General Electric Company, Bridgeport 2, Connecticut.

*TRADE-MARK REG. U. S. PAT. OFF.

GENERAL ELECTRIC

HI-AMBIENTS

Application hints on the complete Deltabeston line

FLEXIBLE HINGE CABLE for swinging panel connections and general switchboard work is available in the Deltabeston Switchboard Wire and Bus Cable line. Insulated with felted asbestos and covered with cotton braid with flame-resistant finish, it is essential for wiring switchboards up to 90 C (194 F).

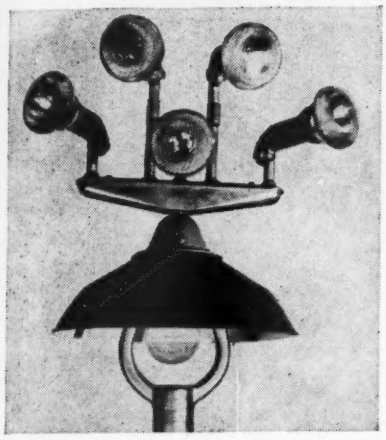
SPREADING OUT. Originally designed for infrared oven use, silicone-treated Deltabeston cables proved so successful that now they're being used for both 300- and 600-volt service on many extra-high heat applications. On jobs where the temperature goes as high as 200 C (392 F), specify silicone-treated Deltabeston.

MOISTURE RESISTANCE is only one of many advantages Deltabeston power cable offers you. Like all Deltabeston products, it's a heat beater because it's insulated with purified asbestos. Varnished cambric and heavy braid or lead sheath help resist abrasion, flame, grease, corrosive vapors, and oil.

SIMPLIFIES SELECTION. To help in the selection of the proper Deltabeston magnet wires for the jobs you've got to do, General Electric has prepared the *Deltabeston Magnet Wire Booklet.* This handy guide contains facts on the many kinds of magnet wire made by General Electric, and includes a handy specification chart to make selection easy. For your free copy, write to Section Y26-418, Construction Materials Department, General Electric Company, Bridgeport 2, Connecticut.

DELTABESTON
Wires and Cables
Built to beat the heat

Equipment News



Lighting Fixture

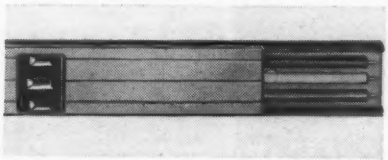
A versatile new cluster-light fixture has been introduced. It contains up to six lamps and each separate lamp can be used either for flood or spot lighting, and can be adjusted up and down or to either side, assuring exact light for specific lighting needs. Either 100-300 watt medium base lamps, or 300-500 watt mogul base lamps can be used with the new units. Lock nuts hold the individual lamps in the desired lighting positions after easy adjustments have been made. Of rustless aluminum, they give protection from dirt and moisture. It is designed to replace island and other reflector installations. Killark Electric Manufacturing Co., Vandeventer & Eastern Aves., St. Louis 13, Mo.

Wire Stripper

A new improved hand type, pocket size wire stripper called the "Stripmaster" has been announced. Featuring an "automatic" cam action that releases the jaws, the wire may be removed after stripping. It is designed for stripping building, fixture or telephone wire, lamp and portable equipment cords (individual conductors) automotive wiring, radio and instrument wire and cable, switchboard and aviation wire, FM and TV down lead wire. Four models handle all wire gauges from No. 22 to 8. A fifth model is designed especially for FM and TV down lead wire. Blades are interchangeable on all models. Ideal Industries, Inc., 1041 Park Ave., Sycamore, Ill.

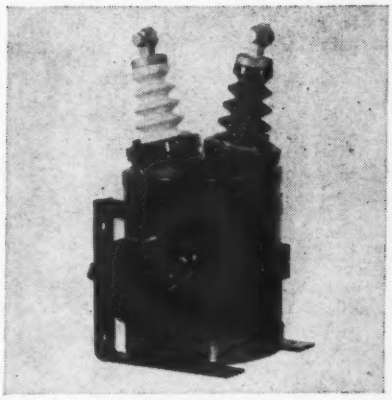
Control Transformers

A new line of Class 9070 Type A control circuit transformers, designed specifically for use with indusrtial control equipment has been announced. To provide secondary circuit protection, either one or two fuse and bracket assembly units can be mounted directly on the transformer. They are built especially for front-wired control panel use. Accessible, screw type terminals permit panel wires to run directly to the transformer. Units are available in 50, 100, 150, 300 VA at either 60/60 or 25 cycles and 500 VA at 50/60 cycles, with primary voltages of 220-440 (dual voltage), 550, 440, 380 and 220 and secondary voltages of 110 or 24 volts. Square D Company, 4041 N. Richards St., Milwaukee 12, Wis.



Multi-Outlet

Two types of residential electrical service are provided by the installation of a new model Plug-In strip. With this multi-outlet assembly mounted on baseboard or as chair-rail molding, home electrical equipment can be selectively controlled at either wall or equipment. Three No. 12 AWG copper conductors have been factory-wired into the Plug-In strip. These conductors serve the three-slot receptacles which are spaced at 18 inch intervals along the 24 gauge steel assembly. Floor and table lamps, and other equipment desirable for control from wall switch, are plugged into two of the three receptacle slots. The radio, blanket, television set and alarm clock, preferably controlled at the appliance, are plugged into the center and lower slot for constant electrical service. Receptacles also provide choice of either switch control or constant service every 18 inches. It has a permanently locked-on cover. It carries UL approval. A hollow steel quarter round known as Lopo-Trim, may be installed on the Plug-In strip. National Electric Products Corp., Chamber of Commerce Bldg., Pittsburgh 19, Pa.



Instrument Transformer

A new instrument transformer designed for outdoor service and suitable for operating meters, relays and control devices has been announced. Designed as Type JEA-3, the new potential transformer is of sealed construction with a mounting bracket which permits it to be mounted in any position—vertical, horizontal or inverted. It is available in ratings of 2400:120 volts and 4800:120 volts, 60 cycles. Both types have insulation for a 60 kv, full wave impulse level. Core and coils are impregnated with an asphalt base compound of high dielectric strength, making coils impervious to moisture. Primary terminals are brought out through porcelain bushings on top of transformer; while secondary terminals are threaded studs in a weatherproof compartment on the side of the sheet steel case. General Electric Co., Schenectady 5, N. Y.

Fluorescent Fixture

A Silv-A-King two lamp industrial unit for use with new 75 watt 96 inch T-12 slimline lamps has been announced. Features include streamlined design, heavy gauge metal and the "E-Z Lok" attachment. Slide-grip grooves run the entire length of the unit, together with slide-grip hangers. New type spring-action lampholders hold lamps securely in position. No starters are required, being of the instant start type. Furnished with either porcelain-enamel or baked-enamel reflectors. Bright Light Reflector Company, Inc., Fairfield and State Streets, Bridgeport, Conn.

fittings for

•thinwall conduit •rigid conduit •metallic and non-metallic cable •flexible steel conduit • service entrance cable •grounding devices •lighting fixture fittings

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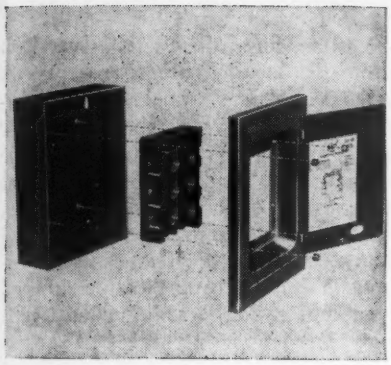


Residence Panels

New Noark 4 and 6 circuit residence panels have been announced. They consist of box, Bakelite socket base and cover. Removal of four hex nuts gives quick access to the socket block, which can be turned to bring leads into the enclosure through either top or bottom. No screw heads show when one piece front is closed. Knockouts are on the sides and back. They are available in flush or surface mounting types. There is a plaster adjustment on the flush mounted models. Panels carry UL approval. Federal Electric Products Co., 50 Paris St., Newark 5, N. J.

Meter

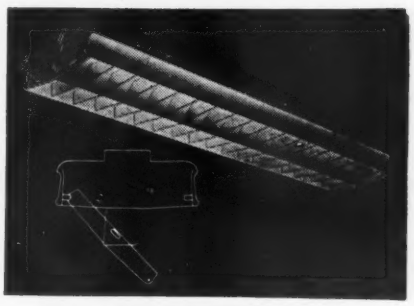
A combination polyphase watthour and thermal demand meter in a case no larger than the standard three-element watthour meter has been announced. Designed for light industrial and commercial loads where it is desired to incorporate a demand feature within the rate, the new type CAH combination meter reduces space requirements and installation costs. They are available for three phase, three wire; three phase, four wire delta; open wye network; and three phase, four wire wye operation in the usual ratings of 5, 15, and 50 amperes at nominal application voltages of 120, 240 and 440. Meters are available in the standardized A-base design. Westinghouse Electric Corp., Pittsburgh 30, Pa.

Signal Systems

New industrial signal systems, known as Panalarms, have been announced. They are multiple signal and alarm systems with a broad range of use on process work, power plants and other applications where sound and visual alarms are required to indicate failure or changes off normal. They may be actuated by any remote switch, thermostat, float-switch. Lamps glow dimly during normal operation. If signals go out of service or bulbs burn out, operator knows this at once. Cabinets are available in multiple units up to 12 in a single cabinet. Each cabinet contains a wiring strip which is capable of receiving any combination of the various alarm units. Cabinets are adapted to flush mounting on central control panels or to wall mounting in any desired location. Panalarm Products, Inc., 7218 North Clark St., Chicago 26, Ill.

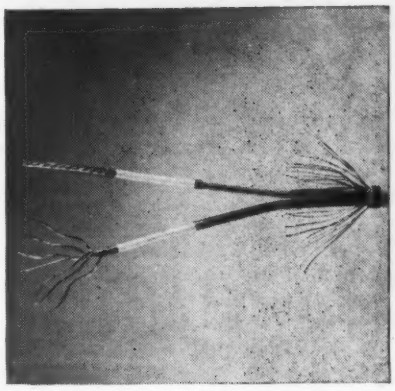
Mounting Brackets

Two universal mounting brackets for television aerial installations have been announced. No. 8000 is a hinged mast bracket that can be used at any angle. Antenna can be assembled in downward position and then swung up. Two bolts are necessary to tighten the mast in position. It is made of aircraft aluminum. No. 80001 chimney mount is made of aluminum aircraft and both brackets can be spread to any width desired. Brackets can also be mounted on gables, corners, or flat surfaces. Both types will hold masts up to 1⅜ inch diameter. General Cement Manufacturing Co., 919 Taylor Avenue, Rockford, Ill.



Fluorescent Fixture

This new radiant fluorescent fixture, Guthlite, Jr., offers a new appearance, unusual lighting effect and lighting performance. It is designed in modern lines. When illuminated, side and spill lighting gives it a radiant glow. This luminous effect is accomplished without glass or plastic panels. Diffuse aluminum louvers provide shielding and low brightness at normal angle of view. Unit features an easy-to-open hinge so that louvers may be hinged to either side, or removed for easy lamp and starter changes. Edwin F. Guth Company, 2615 Washington Avenue, St. Louis 3, Mo.



Cable

A new service entrance cable for carrying electricity from main power lines to homes, offices and industrial buildings has been developed. The new cable has a natural rubber insulation around its conductors and outside jacket made of neoprene. Neoprene jacket will eliminate "festooning", the separation of the outside braid from the cable. Jacket also gives cable unusually high resistance to rain, ice and sleet, deterioration by sunlight, and it is fire retardant. Cable is approximately one quarter inch smaller in overall diameter than braided types. Cable is available in the following sizes: three No. 6 conductors, two No. 6 conductors and one No. 8 conductor, three No. 8 conductors. It is approved by Underwriters Laboratories. United States Rubber Company, Rockefeller Center, New York 20, N. Y.

Adjustable Channel Clamp

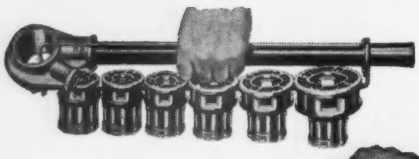
For supporting runs of conduit from structural channel or angles, where drilling of such building members is either forbidden or too costly, this new adjustable channel clamp, No. 177, solves the problem. It rigidly grips various sizes of steel channels or angles. This clamp has a load rating of 500 pounds, with a factor of safety of five. The Kindorf Co., 681 Market St., San Francisco 5, Calif.

Pipe Threader

This new portable power pipe threader, No. 165, is operated by any ½-inch standard electric drill. It threads 1 in, 1¼ in., 1½ in. or 2 in. pipe with one set of high speed steel chasers. Weight is 26 pounds. Threader is furnished complete with one set of chaser and drive adapter. Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago 30, Ill.

Now it's a Cinch

TO THREAD SMALL PIPE



Free handy carrier for any group of sizes.

RIDGID Ratchet Threaders No. 00R, 111R and 12R are extra handy for 1/8" to 2" pipe

● Light strong efficient RIDGID ratchets give you perfect threads on 1/8" to 2" pipe—fast, without bothersome get-ready. Precision cut tool-steel dies. Die heads snap into ratchet ring from either side, can't fall out. You don't need special dies for close-to-wall threads. No. 00R, 1/8" to 1" pipe; No. 111R, 1/8" to 1¼"; No. 12R, 1/8" to 2." Conduit dies furnished on request. Buy these handy work-savers at your Supply House.

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WORK-SAVER PIPE TOOLS

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Plugs, Receptacles and Connectors

A new line of midget Ever-Lok automatic locking plugs, receptacles and cord connectors has been announced. Featuring the automatic locking Ever-Lok construction, the new units are smaller in size. Typical locations for these units are in offices, institutional buildings, and industrial plants. Some of the features are: receptacle has fully protective hinged cover and gasket, strong spring keeps door closed and dust-tight, solderless terminals with metal shield for protecting terminals. Contacts are precision formed and self wiping and self aligning for assuring good connections. Plugs automatically lock in receptacles or connectors. Adjustable cord grips eliminate strain on connections. All units are steel-clad, protecting contacts and terminals from damage or accidental contact. All interiors of molded arc-resisting composition. Russell & Stoll Company, Inc., 125 Barclay Street, New York 7, N. Y.

Fluorescent Fixture

This new slimline fluorescent fixture has been developed in two types, for standard industrial locations and for textile mill locations. Both types of fixtures are designed for use with two 96 inch T-8 lamps. Fixtures are available with 200 ma. or 300 ma. ballasts. Construction features include a choice of baked enamel or porcelain enamel top channel. All reflectors are vitreous porcelain enamel finish. Units available for individual or continuous installations. Center lamp support which prevents vibration of the 8 foot lamps can be provided. Textile mill units are provided with a peaked top channel which prevents accumulation of lint, dust and moisture. Wheeler Reflector Company, 275 Congress Street, Boston, Mass.

Spotlight

A new compact adjustable spotlight, known as "Adjust-O-Spot", has been announced. It rotates 360 degrees in any direction, tilts to 27 degrees on the vertical. Self-locks in any position. Takes either an R-40 or PAR-38 lamp. Comes in brushed satin chrome finish, or colors. Louver and heat resisting glass color filters are available. Unit carries UL approval. Litecraft Mfg. Co., 135 Rome St., Newark, N. J.

"...And be sure the panel boards are equipped with I-T-E Type ET Thermal Circuit Breakers"

"WHY I-T-E? All panelboard breakers are alike."

"They may *look* alike, but actually there's a world of difference between ordinary thermal breakers and those I-T-E ET's."

"That's news to me—what do you mean, 'a world of difference'?"

"Well, for one thing, the ET's use up to 25% higher contact pressures; contacts have less tendency to oxidize, and contact temperatures and resistances are kept to a minimum."

"In other words, the contacts will last longer, besides giving more positive action. Go on—"

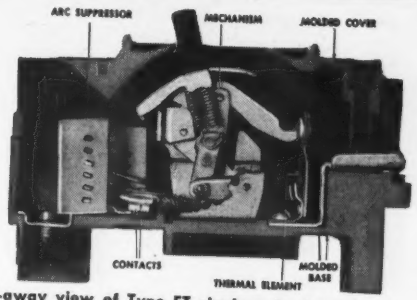
"I-T-E thermal elements operate at high temperature rise—that means your derating factors are kept to an absolute minimum."

"Well, that's something—but, tell me, how do ET's stand up?"

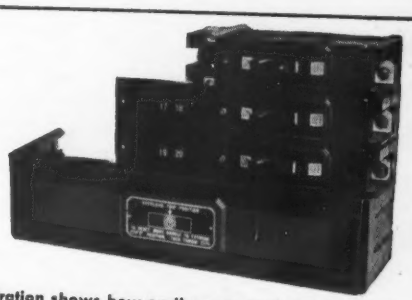
"They're really rugged—that's one of the best reasons for using them. All the metal parts are heavier, and the operating parts are stronger. They'll stand up better and last longer under any conditions. And that's not all . . ."

"O.K.—you've convinced me. From now on, I'll always recommend I-T-E Type ET Thermal Breakers for every panelboard or load center installation."

For complete information on I-T-E series ET Thermal Breakers, send for catalog 5003. I-T-E will be glad to supply you with the names of panelboard builders in your locality who will equip your panelboards with I-T-E Series ET breakers.



Cut-away view of Type ET single pole circuit breaker for panelboard mounting. Note heavier metal components, oversize springing for positive contact and operation.



This illustration shows how easily an attractive panelboard can be constructed using Type ET breakers and panelboard accessories.

TYPE CIRCUIT BREAKER	AMPERE RATINGS	VOLTAGE RATINGS AC	VOLTAGE RATINGS DC	UNDERWRITERS' LABORATORIES INTERRUPTING RATINGS AC	UNDERWRITERS' LABORATORIES INTERRUPTING RATINGS DC	NEMA INTERRUPTING RATINGS AC	NEMA INTERRUPTING RATINGS DC	STANDARD FEATURES: QUICK MAKE QUICK BREAK MECHANISM	STANDARD FEATURES: TYPE OF TRIP: THERMAL ONLY	STANDARD FEATURES: TYPE OF TRIP: THERMAL AND ADJUSTABLE MAGNETIC	STANDARD FEATURES: TYPE OF TRIP: NON-ADJUSTABLE MAGNETIC	STANDARD FEATURES: TYPE OF TRIP: ADJUSTABLE MAGNETIC	STANDARD FEATURES: NON-INTERCHANGEABLE TRIP UNIT	STANDARD FEATURES: INTERCHANGEABLE TRIP UNIT	SPECIAL FEATURES: NON AUTOMATIC	SPECIAL FEATURES: THERMAL AND ADJUSTABLE MAGNETIC TRIP	SPECIAL FEATURES: AUXILIARY SWITCHES	SPECIAL FEATURES: ALARM SWITCHES	SPECIAL FEATURES: SHUNT TRIP	SPECIAL FEATURES: UNDERVOLTAGE TRIP	SPECIAL FEATURES: MECHANICAL INTERLOCK	SPECIAL FEATURES: CENTER TAPPED STUDS	SPECIAL FEATURES: DRAWOUT STUDS
PANELBOARD AND INDIVIDUAL MOUNTING 1, 2 & 3 POLE	10-50	(1 POLE) 125 (2 & 3 POLE) 250	(1 POLE) 125 (2 & 3 POLE) 125/250	5,000	5,000	5,000	5,000	●	●				●		●									
100 AMP FRAME NON-INTERCHANGEABLE TRIP 2 & 3 POLE	10-100	250 600	125/250 250	5,000 10,000	5,000 10,000	5,000 15,000	5,000 10,000	●		●		●	●		●	●	●	●	●	●	●	●	●	●
100 AMP. FRAME INTERCHANGEABLE TRIP 2 & 3 POLE	50-100	250 600	125/250 250			5,000 15,000	5,000 10,000	●		●				●	●		●	●	●	●	●	●	●	●
225 AMP FRAME 2 & 3 POLE	70-225	250 600	125/250 250	10,000	10,000	15,000	10,000	●		●	●			●	●		●	●	●	●	●	●		●
600 AMP FRAME 2 & 3 POLE	125-600	250 600	125/250 250	10,000	10,000	25,000	20,000	●		●	●			●	●		●	●	●	●	●			●

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I-T-E CIRCUIT BREAKER COMPANY, 19TH & HAMILTON STREETS, PHILADELPHIA 30, PA.

31 OFFICES IN UNITED STATES AND CANADA

SWITCHGEAR • UNIT SUBSTATIONS • ISOLATED PHASE BUS STRUCTURES • AUTOMATIC RECLOSING CIRCUIT BREAKERS • RESISTORS • SPECIAL PRODUCTS

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THE AIR YOU BREATHE SHOULD BE AS PURE AS THE WATER YOU DRINK!

2 Colorful Displays to help you sell!

ILG Ventilate Your Kitchen
RID YOUR HOME OF COOKING ODORS, FUMES and HEAT
Quiet...Smooth Running...
INSTALL IN ANY OUTSIDE WALL!

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KITCHEN VENTILATORS

EACH DISPLAY COMPLETE WITH HARD-HITTING SELLING HELPS!

Feature the nation's best-known make of kitchen ventilators. Get both of these colorful ILG Kitchen Ventilator displays up in heavy traffic spots. It pays. Here's why!

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NO SATURATION of kitchen ventilator market. Your potential sales are practically unlimited!

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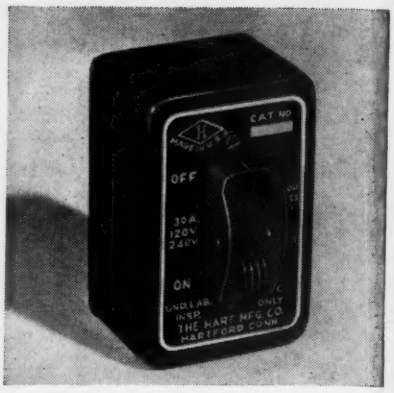
Individual_____ Title_____

Address_____ Zone_____

City_____ State_____



Switch

A new motor control switch for motors up to two hp. has been developed. Rated 2 hp. or 30 amp. 240 volt, a-c only, the switch in both single and double pole models has slow break action. This eliminates mechanical impact strain and provides greater durability in service. It uses no screws or rivets to carry current. Compact and end-connected for easy wiring, it has a long toggle for easy operation. Contacts are silver. Switch is available with or without the streamlined box and has UL approval. The box, which measures 4 in. by $2\frac{5}{8}$ in. by $2\frac{1}{4}$ in., has knockouts on five sides. Toggle guard permits locking in either off or on position. Hart Manufacturing Company, Hartford, Conn.

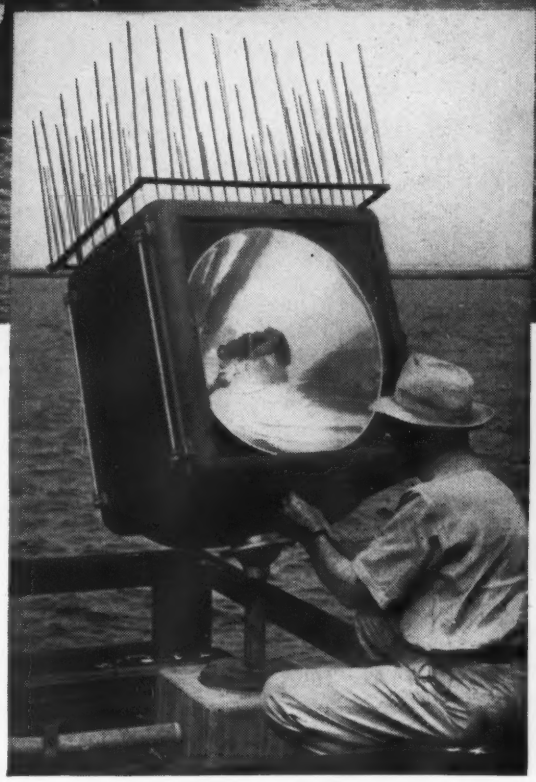
Bushings

These new insulated metallic conduit bushings provide protection against abrasion of cable insulation and accidental grounds. Known as "Bushends", they require no inside locknuts. Metal bases are fabricated from corrosion resistant, wrought alloy of high mechanical strength. Knurls are extra deep to facilitate tightening in restricted, hard-to-get places. Approved by UL. Buchanan Electrical Products Corp., 1290 Central Avenue, Hillside, N. J.

Ground Clamps

Grounding and bonding devices of cast bronze are now available. Type XCIV for No. 8, 6, 4 Awg bare copper wire, type XCV for No. 8, 6, 4 Awg bare armored wire, type XCVI for No. 10 solid to 3/0 Awg copper grounding conductors. For use on $\frac{1}{2}$ inch—6 inch ground pipe—ratchet adapters. Construction provides safe permanent ground for home and industrial applications. Carry UL approval. Mercury Electric Company, Inc., 30 Irving Place, New York 3, N. Y.

GREATER SAFETY AND FLIGHT REGULARITY AT IDLEWILD....



....with 3 Billion Candle Power "ALL WEATHER GUIDE LIGHTS" powered through HAZARD'S KEYSTONE-HAZAPRENE CABLE

Of the many important electrical advances made in airport lighting, power transmission and flight control at the New York International Airport, one of the most interesting is the "All Weather Guide Lights."

Designed to provide pilots with reliable visual guidance in adverse flying conditions, these high intensity approach and contact lights consist of 35 Blaze Units, 35 Flash Units – all controllable from the operational tower.

One of the insulated wire and cable requirements at Idlewild served by Hazard is the power supply to these vital lighting aids, and here Keystone-Hazaprene Cable is used.

For high voltage circuits, Hazard's Keystone insulation effectively combines in one oil base compound unusual resistance to ozone, heat, moisture, sunlight, chemicals and acids. Protected with a Hazaprene sheath (a Hazard-developed neoprene compound) – Keystone-Hazaprene Cable assures the long-lived, trouble-free service required from these lighting circuits.

In planning electrical wire and cable needs for modern airports, you'll find Hazard's engineering experience, outstanding insulations, and protective coverings will help you obtain the right answer to your particular operating conditions. For example, over twenty years field service under severe operating conditions has proved Hazasheath and Armortite Cable ideal for trouble-free, long-lived power transmission, communication and control circuits. Non-metallic sheathed, these cables are light-weight, quick and easy to install... are buried direct or run in conduits. Whatever your need, you can rely on Hazard Insulated Wires and Cables for long, continuous, safe, trouble-free service. Our engineering service is available without obligation. Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pa.

High Intensity, Controllable, All Weather Guide Lights at New York International Airport, Idlewild, N. Y., installed by Hoffman and Elias. Flash and Blaze units alternate, with the Flash Units capable of developing 3 billion candlepower to assure pilots of visual contact with field through poorest weather conditions. Wire "feelers" on top of each light discourage seagulls from landing.

KEYSTONE-HAZAPRENE

ARMORTITE

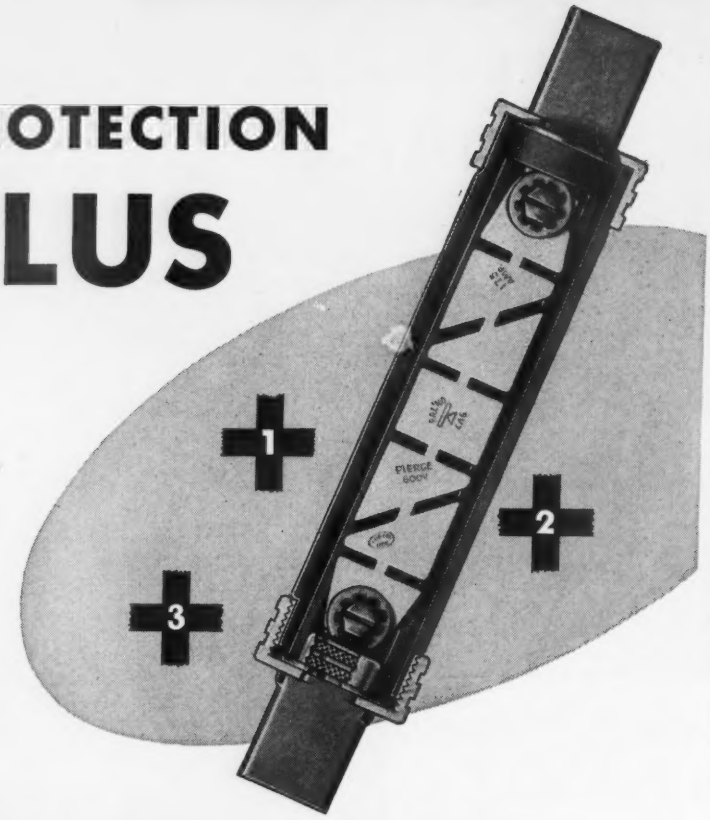
HAZASHEATH

HAZARD

6003

insulated wires and cables for every electrical use

PROTECTION PLUS



PIERCE PLUS-VALUES . . . MORE *For Your Money*

Of course, all good fuses meet Underwriters' requirements, but only Pierce fuses have these *three protection extras.* Pierce fuses are designed to prevent costly power interruption from unnecessary fuse failure. Pierce fuses . . . and only Pierce fuses . . . have these exclusive protection-plus features:

PROTECTION AGAINST BLOW FROM HARMLESS SURGES

Pierce "Balanced Lag" link sustains harmless jolts and surges in the working overload range which often blow ordinary fuses. Yet it blows instantly on dangerous short or ground. By sustaining all safe loads, blowing only when danger threatens, "Balanced Lag" eliminates costly, unnecessary power interruptions.

PROTECTION AGAINST CASE FAILURE

The strong tubular bridge construction and simplicity of design in Pierce fuses ensure maximum case life and clip contact, and prevent the misalignment common to ordinary fuses.

PROTECTION AGAINST AFTERBLOW

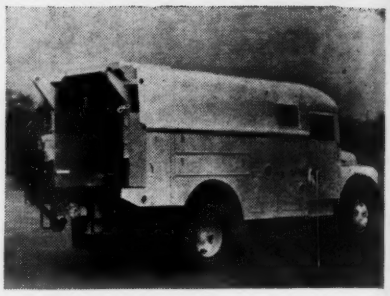
Pierce fuses are screen-ventilated and operate from 10 to 50 per cent cooler, preventing unnecessary blow from stored or secondary heat held in ordinary fuses.

PIERCE

For Forty Years, Specialists in the Design and Manufacture of Fuses

RENEWABLE FUSES, INC.

177 Pacific Avenue ★ Buffalo 7, N. Y.



Truck Body

A new model 7-man crew compartment line construction body has been announced. Known as Model 5805, it replaces Model 3714 and mounts on chassis with wide flat faced cowl. Compartment carries seven men and is integral with body. Cab accessible from both sides of body and hinged front seat permits easy entrance to rear seat. Body is designed to take advantage of extra space provided by extra wide hood and fender lines in current chassis. American Coach & Body Company, Cleveland, Ohio.

Timer

A new electronic timer, Type 30-HL1, has been announced. It is an automatic timer for intervals from ½0th second to four minutes. It is recommended to control such equipment as spot welders, grinders, honing machines, drilling machines, conveyors, automatic filling machines and photographic printers. Unit provides four basic types of timing: interval, delayed action, automatic repeat and programming. Either 115 volt or 230 volt, 50-60 cycle a-c may be used. Photoswitch Incorporated, 77 Broadway, Cambridge, Mass.

Fans

A belt driven fan, designed to exhaust hot, stagnant air, replace with cool air and provide healthful ventilation, has been announced. Construction of fan simplifies installation in homes, commercial and industrial applications. Unit is fabricated of metal; streamlined in design, blades are all steel; two bearings on fan shaft are porous graphite bronze, rubber insulated, and has large oil reservoirs; fan duty motor is rubber mounted, and has automatic overload. Manufactured in size 24, 30, 36, 42 and 48 inches. Seco-Lite Manufacturing Co., 4916 Easton Avenue, St. Louis 13, Mo.

[Continued on Page 174]

ELECTRO'S NEW "twenty-twenty" for PERFECT VISION

- **Low in Price.**
- **Low Cost Installation—Maintenance.**
- **High Efficiency.**
- **Individual or continuous, surface or pendant mounting.**
- **Safe . . . all steel construction.**

NEXT YEAR'S LIGHTING IS HERE TODAY

with **ELECTRO'S** new **"TWENTY-TWENTY"** for perfect vision. Designed for schools and institutions, the **"TWENTY-TWENTY"** gives high efficiency, safety, and ease of maintenance . . . at low cost.

Cut-off specifications 35°-25° with 70% of light directed downward, 30% directed upward, for even distribution without shadows.

ELECTRO'S "TWENTY-TWENTY" is easy to install. Louver panel is in one complete section, hinges from either side, and can be completely removed without nuts, bolts or special attachments.

All metal construction finished in **ELECTRO'S** exclusive liquid-plastic, baked enamel.

A FLEUR-O-LIER MANUFACTURER

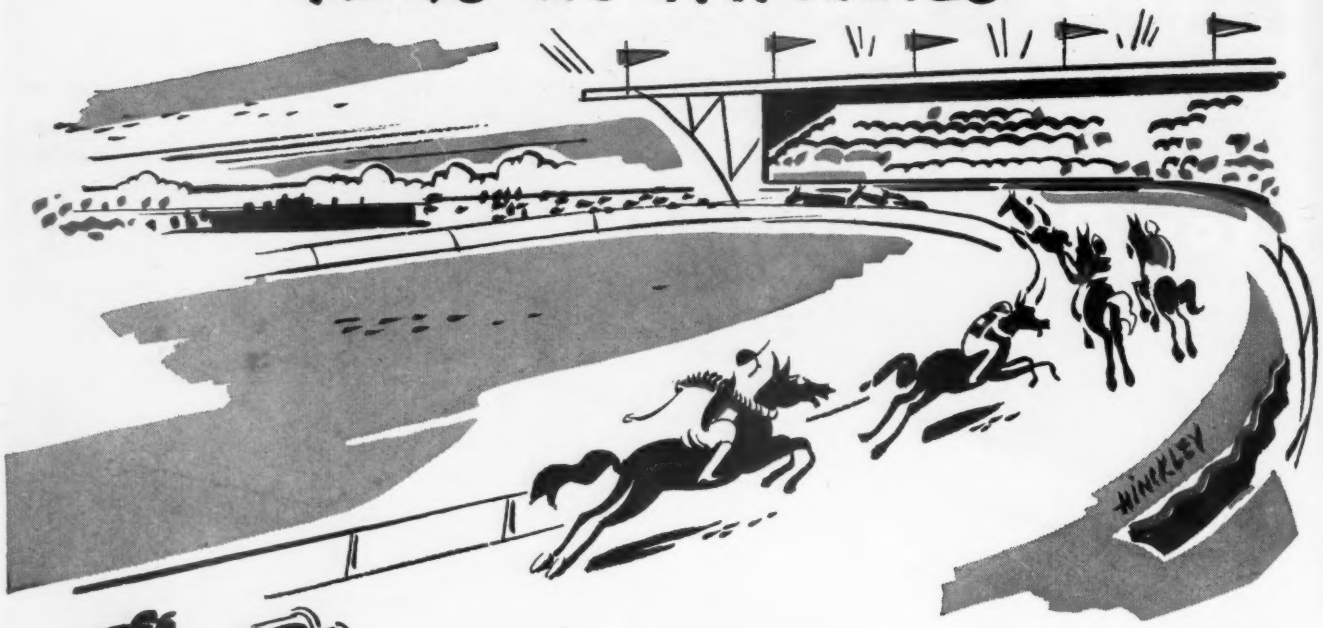
Contact your nearby **ELECTRO** representative for complete information . . . or write **ELECTRO MFG. CORP., DEPT. SL-7.**

ELECTRO'S LIGHTING ENGINEERS ARE ALWAYS AT YOUR SERVICE

ELECTRO MANUFACTURING CORPORATION

2000 W. Fulton St. • Chicago 12

YOUR CENTRAL CONDUIT DISTRIBUTOR PLAYS NO FAVORITES



CENTRAL SPANG CONDUIT

● Your Central Conduit Distributor places a high value on customers' good-will. He plays no favorites during these times when demand for conduit is at an all-time high. Your Central Conduit Distributor knows that *all* of his customers are entitled to a fair share of his conduit supply. Consequently, he divides every shipment equitably and delivers it in a hurry.

Meanwhile, we are trying every way we know how to produce more Central Conduit so that your distributor can serve you better.

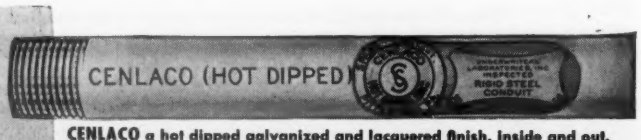
Call your Central Conduit Distributor first when you need conduit or other electrical supplies. He is a dependable source of supply and will do everything possible to meet your demands.

SPANG-CHALFANT

Division of The National Supply Company

General Sales Office: Grant Bldg., Pittsburgh, Pa.

District Offices and Sales Representatives in Principal Cities

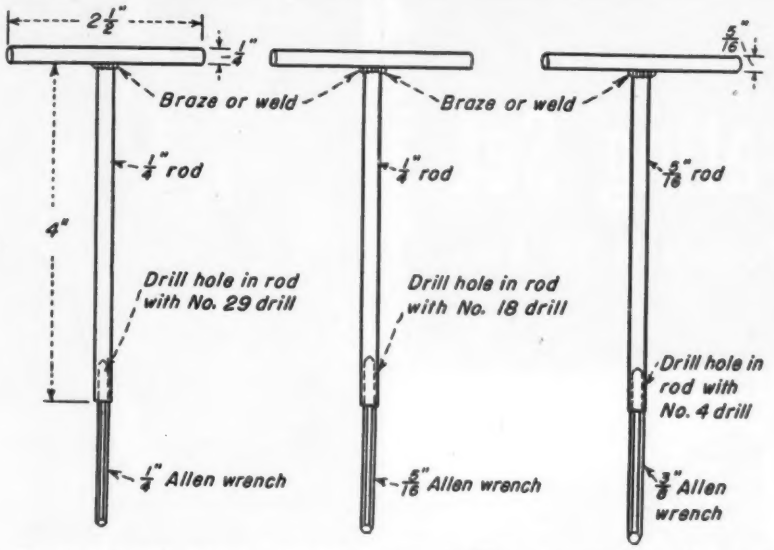


CENLACO a hot dipped galvanized and lacquered finish, inside and out.

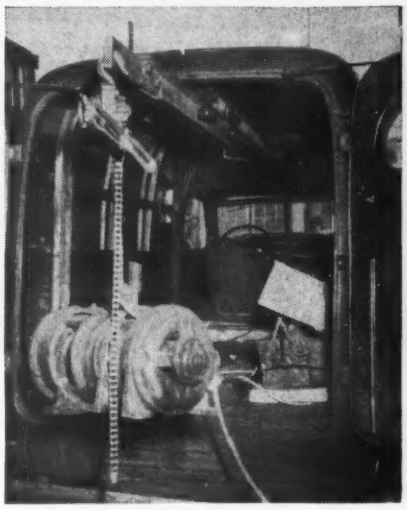
CENTRAL WHITE electro-galvanized outside and black enameled inside.

CENTRAL BLACK permanent, baked-on black enamel finish, inside and out.

Motor Shops



T-extension handles increase usefulness of Allen wrenches in the motor repair shop.



Retractable hoist on panel delivery truck permits one man to pick up and deliver heavy electric motors.

T-Extensions For Allen Wrenches

Electric motors frequently come into the repair shop with pulleys and gears on the shafts. John Havranek of Central Electric Company, Cambridge, Mass., found that 90 percent of the pulleys and gears were attached to the shaft with Allen set screws. To facilitate their removal, he fabricated T-extension handles for standard Allen wrenches.

The following construction details were submitted in the 1948 NISA Awards Contest and released for publication through the courtesy of the 1948 Awards Committee of the National Industrial Service Association.

To make the wrenches Havranek used a 4-inch length of ¼-inch steel rod; brazed a 2½-inch handle of similar rod on one end of the 4-inch piece. In the opposite end, he drilled a hole (No. 29 drill) to accommodate a ¼-inch Allen wrench. The short end of the wrench was cut off and the rough end ground. The wrench was then driven into the hole at the botom of the T-extension.

The extension for the 5/16-inch Allen wrench was also fabricated of ¼-inch rod, but a No. 18 drill was used to drill the hole to hold the wrench. The ⅜-inch Allen wrench required a No. 4 drill and a 5/16-inch steel rod T-extension.

Under severe strain, the Allen wrench may loosen up in the handle. Then it can be brazed. However, retempering of the heated portion of the rod should not be attempted as it will become brittle and break.

Men in the Central Electric Company shop find these "T-wrenches" are a real necessity for working in hard-to-reach places.

Retractable Hoist For Panel Truck

Lifting heavy motors into a one-ton panel delivery truck is a one-man operation at Domizio & Everts, Inc., motor service shop at Yonkers, N. Y. To make this possible, James Domizio designed and installed a retractable beam hoist inside the truck. Entered in the 1948 NISA Award Contest, this shop idea is published through the courtesy of the 1948 NISA Award Contest Committee.

Two inverted-U supports made of steel rail (might be channel or other structural steel member), bent to fit the contours of the panel enclosure, were welded to the truck body. A stationary I-beam welded to these supports provides the monorail for the 8-foot long retractable hoist beam. A heavy steel eye-plate at one end of this beam accommodates the hook of a ratchet chain hoist. The other end of the beam is provided with a screw lever that locks the retracted beam in place. This lever is directly over the truck seats and can be easily operated by the driver.

With this arrangement, one man can easily hoist a 100 hp., 900 rpm. motor and roll it into or out of the truck.

Coil Winder Has Hydraulic Control

Hydraulic control combining braking action with electrical switching and reducing electrical contact maintenance are features of a coil winder designed and built by Consolidated Electric Company of St. Paul, Minnesota. The unit is used in their motor service department.

A rectangular steel frame supports the mechanism. Rounded corner posts are fashioned from quarter sectors of standard 4-inch pipe. Base and top of the frame are made of 1½-in. by 2½-in. angle-iron. Flat iron flanges, welded to the vertical posts, provide mounting for removable steel enclosure plates.

The winding head is driven by a V-belt-sheave through a Plymouth automobile transmission which provides three speeds forward and one reverse position. Additional speed variations from 40 to 900 rpm. can be obtained through a variable speed pulley with a "floating" center element. This is mounted as a jack-shaft between the winding head sheave and the driving sheave on a ¾-hp., 3-phase,

Electric Power Shortages Nation-Wide!

Prepare now with a Universal

Electric Generating Set

Gasoline and Diesel Models to 36 kw.

It's not a scare—it's a fact that most parts of the country are short of power. Soaring electricity demands, slow generator production, lack of rainfall—all have left their mark.

You can lick power curtailment in your plant, building or institution by installing a Universal electric generating set. In the broad, selective line is exactly the size and type, gasoline or Diesel, to meet your needs. 100% full Diesel models to 35 kw.—gasoline sets to 25 kw., AC and DC, all voltages. Manual to fully automatic controls.

Universals are dependable, safe, economical—are backed by our 50 years of manufacturing experience. They are low priced.

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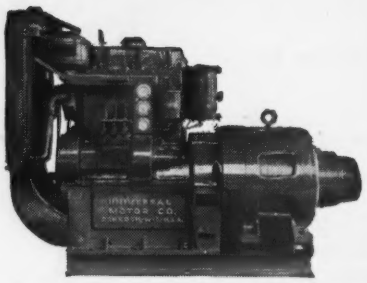
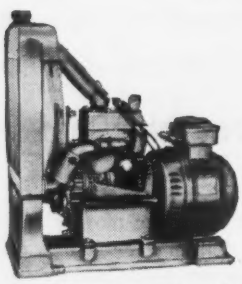
Contractors and Representatives: The power shortage is real. Prepare for brisk demand by taking on the complete Universal line. Write for details.



This Universal 3-cylinder 100% full Diesel model provides a steady 15 kw. Other Diesel sets to 35 kw.

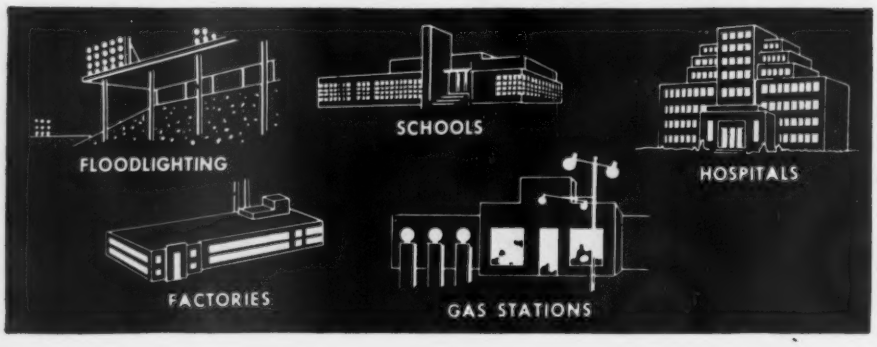


In the gasoline-powered series, this small, low-cost model develops 2500-3000 watts.

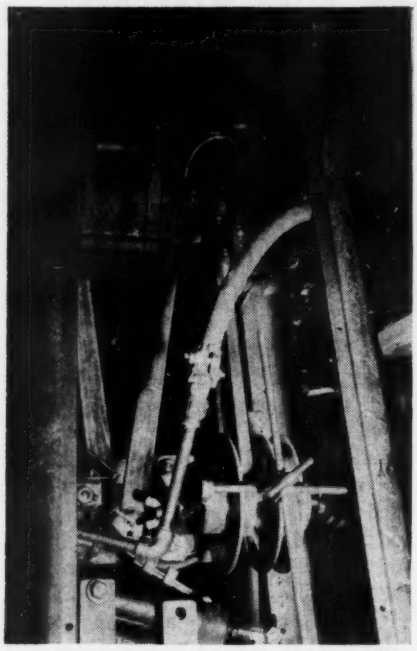
UNIVERSAL MOTOR COMPANY

Manufacturers Since 1898

438 Universal Drive • Oshkosh, Wisconsin



Hydraulic control operates motor starter and mechanical clutch brake on this coil winding machine. Auto transmission and variable speed pulley provide wide speed range.



Variable-speed pulley jack shaft between motor and spindle sheave. Pipe and hose lead from hydraulic cylinder (above pulley) to foot pedal.

220-volt 1800 rpm motor at the base of the frame.

As a lever attachment on the variable speed pulley is raised or lowered, the center "floating" element moves from left to right and changes the groove widths and hence the effective diameters of the double sheave it forms.

CAUTION

. . . . BEFORE YOU SPECIFY EXTRUDED PLASTIC TUBINGS THAT MUST WITHSTAND EXTREME HIGH TEMPERATURES BE SURE YOU HAVE NOTED THE PHYSICAL & ELECTRICAL PROPERTIES OF . . . .

Flexite

THE FLEXIBLE, EXTRUDED PLASTIC TUBING THAT RESISTS HIGH TEMPERATURES ABOVE . . . . 105° C

FLEXITE PHYSICAL & ELECTRICAL PROPERTIES

– tensile strength, minimum average	2500 PSI
– ultimate elongation, minimum average	300%
– dielectric strength, minimum	800 v/mil
– flammability	non-inflammable

– heat resistance – after 100 hours at 300° F. the tubing is not brittle and when flexed does not crack.

– heat endurance – recommended for continuous operating temperatures up to 105° C., and when baked at 125° C. for 2,000 hours does not become brittle.

– low temperature flexibility	–30° C.
– heat shrinkage	ASTM Standards

#20 – #17 incl. – less than 8%
#16 – # 6 incl. – less than 5%
5 and larger – less than 3%

– oil resistance – highly resistant to effects of transformer and lubricating oils, does not stiffen when continuously exposed to them.

Colors – black, white, red, green, yellow and blue are standard colors.

Dimensions and Tolerances – standard sizes to fit B & S wires #20 to #0 inclusive, as specified by ASTM Spec. D922-47T.

Wall Thickness – in accordance with ASTM Spec. D922-47T, as follows:
#20 – #10 incl. – .016" ± .003"
9 – # 0 incl. – .020" ± .003"

Standard Lengths – Standard 36" lengths or continuous lengths in coils. Sizes #20 – #10 incl., will be supplied on paperboard spools when so ordered.

Quality – uniform in quality and condition, smooth on both inside and outside, free of defects such as pin-holes, blisters, foreign inclusions and other imperfections.

Test Methods – properties enumerated in above specifications shall be determined according to Tentative Methods of Testing Nonrigid Polyvinyl Tubing, American Society for Testing Materials, Designation D 876-46T.

YES, FLEXITE is the electrical insulation tubing that sets new standards for resistance to extreme high temperatures. Compounded of a plasticized copolymer of vinyl chloride and vinyl acetate and manufactured with a true wall thickness, smooth inside and outside, FLEXITE PLASTIC TUBINGS offer the greatest resistance to high and low temperatures, are extremely flexible and have great tensile strength

Other significant properties of FLEXITE compare more than favorably with tubings of similar nature. Check the specifications of FLEXITE, compare them with the requirements for your products and if you wish against other insulations for identical use . . .

YES, FLEXITE sets a new high standard for protection against high temperatures, high dielectric, stretching, tearing, abrasion, exposure to acids, oils and alkalies, flammability, etc., etc., etc. – . . . samples and additional information will be sent upon request.

And for a Plastic Tubing to Withstand Normal High Temperatures Mitchell-Rand Offers . . . Flexite-Norm . . . write for specifications.

MITCHELL-RAND INSULATION CO. Inc.

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A PARTIAL LIST OF M-R PRODUCTS: FIBERGLAS VARNISHED TUBING, TAPE AND CLOTH · INSULATING PAPERS AND TWINES · CABLE FILLING AND POTHEAD COMPOUNDS · FRICTION TAPE AND SPLICE · TRANSFORMER COMPOUNDS · FIBERGLAS SATURATED SLEEVING · ASBESTOS SLEEVING AND TAPE · VARNISHED CAMBRIC CLOTH AND TAPE · MICA PLATE, TAPE, PAPER, CLOTH, TUBING · FIBERGLAS BRAIDED SLEEVING · COTTON TAPES, WEBBINGS AND SLEEVINGS · IMPREGNATED VARNISH TUBING · INSULATED VARNISHES OF ALL TYPES · EXTRUDED PLASTIC TUBING

GREENLEE HYDRAULIC BENDER HANDLES WIDE VARIETY OF WORK

Yes, heavy-duty, all-round performance of the GREENLEE Bender expedites jobs, means big time and material savings for W. D. Gale, Inc., Detroit contractors.

Their GREENLEE is pictured above in operation on a recent large installation of new transformers, where it was necessary to make various bends in conduit ranging from 2½" to 3" and 4" sizes.

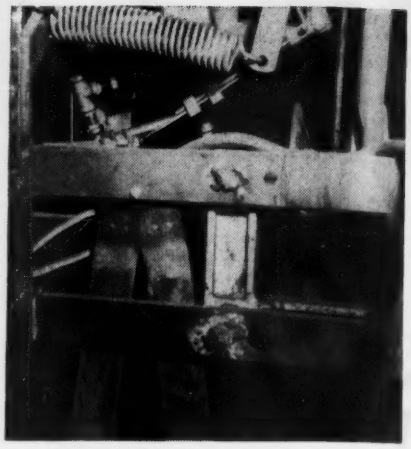
In reporting on the GREENLEE Bender's performance on this job, Gale workmen said, "It's *heavy-duty*—handles the specific bends and the large diameter conduit necessary to fit the job."

J. A. Schoenith, General Manager of W. D. Gale, Inc., also states that the GREENLEE affords 30% savings in labor hours and 30% savings on manufactured bends.

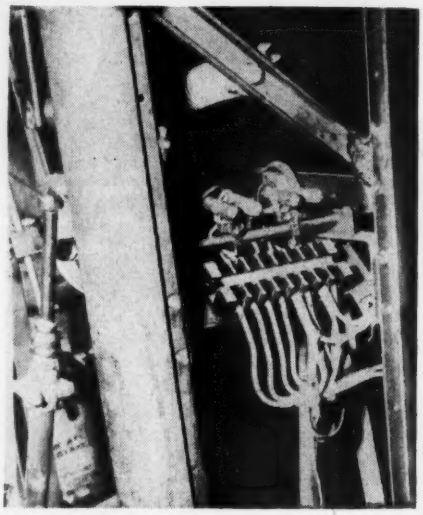
With a GREENLEE *one man* in but a few minutes makes smooth, precise bends in rigid and *thin-wall* conduit, pipe up to 4½", tubing, bus-bars. It's a compact, portable unit—lets you make bends *right on the job.* Quickly pays for itself. Write today for free Bender Booklet E-201. Greenlee Tool Co., Division of Greenlee Bros. & Co., 1744 Columbia Avenue, Rockford, Illinois, U. S. A.

TOOLS FOR CRAFTSMEN
GREENLEE

OTHER GREENLEE TIMESAVING TOOLS FOR ELECTRICAL WORK
Hand Benders • Knockout Tools • Cable Pullers • Electricians' Bits



Back of unit showing brake spring, hydraulic cylinder behind it, and levers that release brake and operate motor starter switches. Inverted-V at bottom are strip heaters for rotor resistance.



Mercury switches for motor starting and running positions are actuated by hydraulic cylinder operated by foot pedal. There are two switches for each position.

A Plymouth clutch disk, mounted on the winding head shaft, provides friction-type braking. A strong coil spring sets the brake. A hydraulic cylinder lever releases it. The same cylinder, through a second lever attachment, operates a block of four sealed mercury switches which place the motor in starting and running position on the circuit. The block of switches pivot on a rod support.

When the hydraulic foot pedal is depressed slightly, the two mercury switches in the motor starting circuit operate and cut in rotor resistance (two conventional strip heaters). Additional pressure on the pedal releases the clutch brake and operates the second group of mercury switches putting the motor directly on the line in running position. Rotor resistance is cut out at the same time. Once the foot pedal is released, the motor is disconnected and the coil spring sets the clutch brake.

What Does
RACO Mean?
RACO (rā'co) 1. The top line of steel switch and outlet boxes. 2. Quick, easy installation for contractors. 3. Dependability for architects. 4. Customer preference and steady demand for jobbers.
You don't need a dictionary to find out what RACO means to the electrical trade. The RACO Line is approved by the Underwriters' Laboratories, Inc. Contractors prefer the well known RACO quality. Architects specify the reliable RACO Line. Wholesalers enjoy the profitable repetitive volume.
You can always rely on RACO
RACO
ALL-STEEL PRODUCTS
ALL-STEEL EQUIPMENT Inc.—800 Kensington Ave., Aurora, Illinois
"A BOX FOR EVERY NEED"

UNEQUALLED

STRENGTH

THE NEW Harvel 1012C Insulating Varnish

The big news in insulation is HARVEL 1012C...an outstanding development by IRVINGTON which provides an insulating varnish with *far greater bonding and cementing qualities than the numerous thermo-setting varnishes tested.* It's a very fast curing resin... absolutely oil-proof, and with excellent resistance to moisture and high temperatures. Unequalled for windings operating at high peripheral speeds as well as those subject to great stresses and strains.

Full information and generous test samples of HARVEL 1012C will be furnished on request. Write today.

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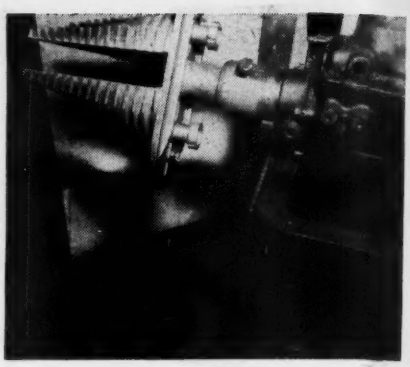
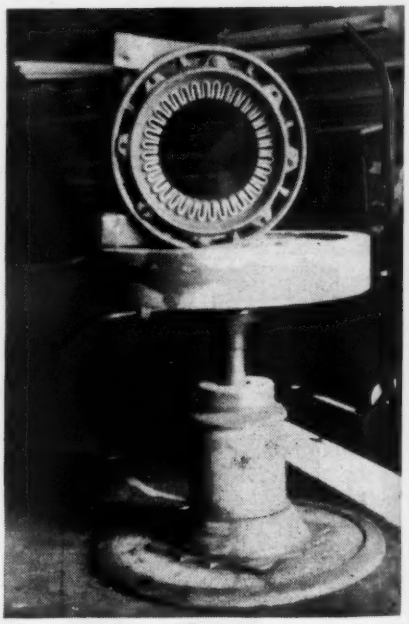
Authorized distributors in Baltimore; Berkeley; Bluefield, W. Va.; Boston; Charlotte; Chicago; Cleveland; Dallas; Denver; Los Angeles; Milwaukee; Minneapolis; New Hartford, N. Y.; New Orleans; New York; Philadelphia; Pittsburgh; Portland, Ore.; St. Louis; Seattle; Hamilton, Ontario, Canada.



Winding head coupling is standard pipe variety with slot cut out to fit over spindle bolt.

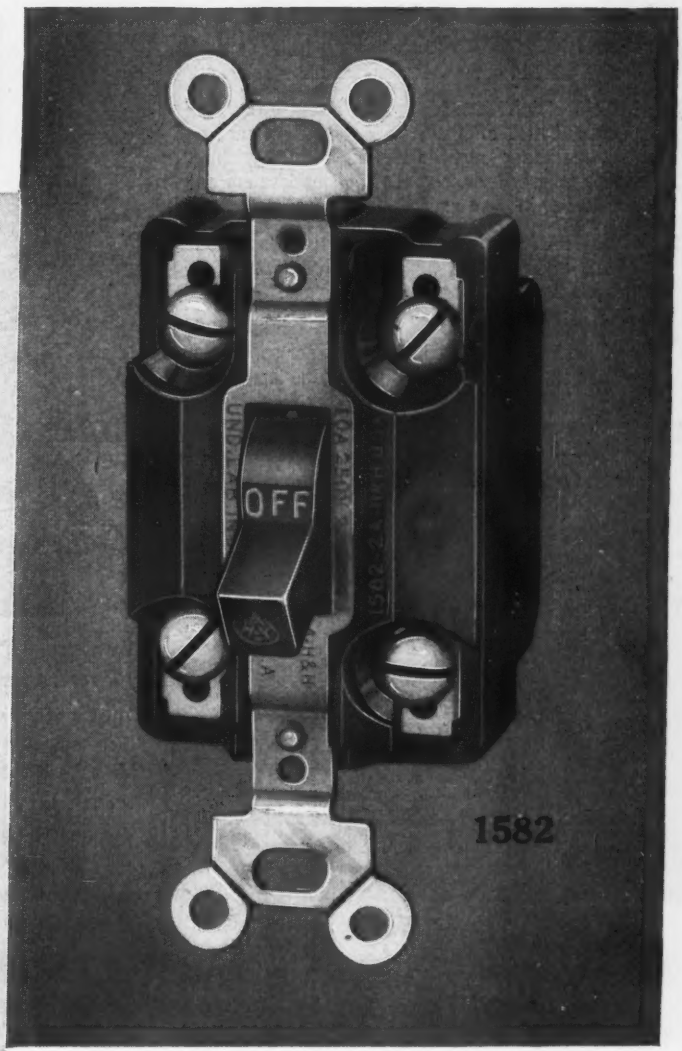
An expansion-type nose on the winding head spindle provides a quick method of attaching various types of heads. A standard pipe coupling, bored out to fit the spindle, is welded to each winding head. A slot, cut in each coupling, slides around a take-up bolt on the spindle. After the winding head coupling is placed on the spindle, the bolt is tightened. This expands the spindle nose. When the bolt is backed-up, the spindle nose shrinks and the coupling can be easily removed.



A second hand barber chair which can be picked up at a very reasonable price if you look in the right places, makes a first class work table by taking off the chair part but leaving the revolving base, which is raised and lowered by means of a foot pedal. "I never tested it completely", said Hugh W. Myers, of the Myers Electric Co., Salt Lake City, who thought up the happy idea, "but I expect it would handle four or five hundred pounds easily. I should, however, put heavy duty casters under it so as to move it easily anywhere in the shop. The hydraulic lift is ideal as you can adjust the work to the most convenient height and the brake arrangement holds it there."

New BACK-WIRED OR TOP WIRED
HEAVY-DUTY FLUSH TUMBLER SWITCHES

ARROW



BACK-WIRING saves bother of bending or looping wires. Wire goes straight in,—is held firmly and permanently by a wire clamp. Makes a neat, strong connection with no exposed wire ends. Use of heavier wire makes back-wiring the easier way; top-wiring (with conventional binding screws) optional with these switches. Wire clamp is especially designed for fast work and a fast hold on No. 10 to 14 wire. Binding screws take same sizes of wire.

"T" RATED — 10 & 20 AMPERES

COMPLETELY NEW re-designed and improved switch mechanism includes these standout features:

(1) Double switch blades protected by two Bakelite barriers which positively snuff the arc.

(2) Self-aligning double switch blades provide positive connection with solid one-piece stationary contacts.

(3) Shallow, recessed Bakelite base, 1½" deep, leaves ample wiring room in the box.

(4) Switch mechanism is totally enclosed in a solid base and protected by durable Bakelite cover.

(5) One-piece base plate with washer-type plaster ears is firmly locked into Bakelite switch cover.

Available in 10 and 20 Amp. sizes for all standard connections.

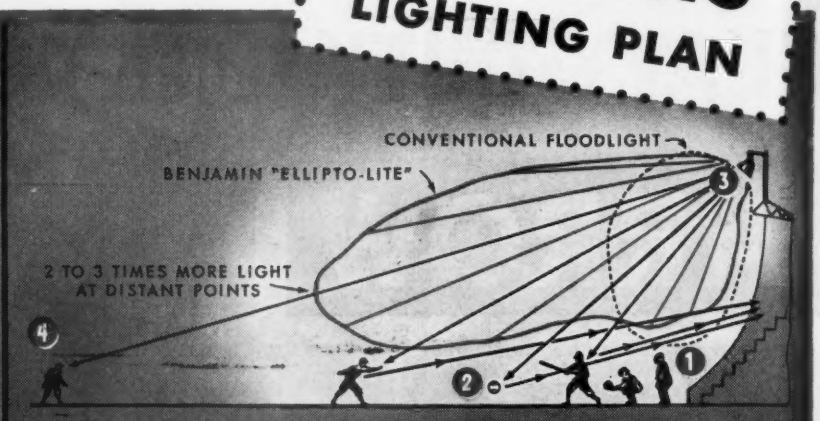
ARROW ELECTRIC DIVISION

THE ARROW-HART & HEGEMAN ELECTRIC COMPANY, HARTFORD 6, CONN., U.S.A.

To assure your customers of a good SPORTS LIGHTING PLAN

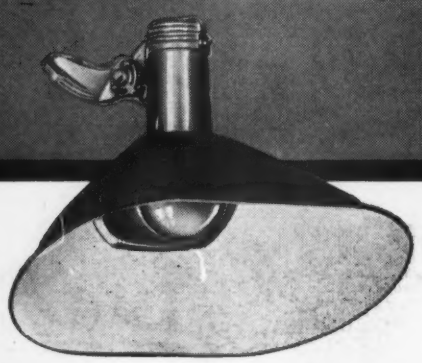
OBSERVE these 4 FUNDAMENTALS

1. **LIGHTING PLAYERS** so they are instantly and easily visible to each other, umpires and spectators.
2. **LIGHTING THE BALL** so no matter how it is pitched, batted or thrown to any position on the field and at any height in the air, it will be plainly visible to everybody, regardless of his location on the field or in the stands.
3. **LIGHTING THE FIELD** without spotty or uneven effects so base lines, foul lines, plate, bases and batter's box are clearly seen by everyone.
4. **LIGHTING WITH A MINIMUM OF GLARE** and shadows so that neither players nor spectators will be annoyed by direct light from the lamps.



SPECIFY lighting equipment which meets these 4 FUNDAMENTALS

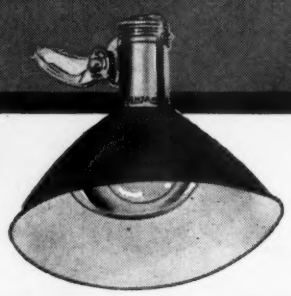
1. CORRECT LIGHT DISTRIBUTION
2. EASE OF INSTALLATION
3. SIMPLIFIED MAINTENANCE
4. LONG LIFE



Benjamin "PLAY-AREA" Floodlight

For 750-1500 Watt Lamps

A wide angle, low brightness, diffusing floodlight. Unit consists of large, open-type, mat finish, Porcelain Enameled steel reflector with inner reflector of oxidized, processed aluminum. The design of the Porcelain Enamel reflector provides maximum shielding of the lamp filament and prevents glare.



"ELLIPTO-LITE" Floodlight

For 300-500, 750-1500 Watt Lamps

A smaller size, open type floodlight of elliptical shape. Porcelain Enameled steel reflector is designed to provide a good degree of lamp-filament shielding to reduce direct and reflected glare.

Secure ALL 8 by Specifying BENJAMIN FLOODLIGHTING EQUIPMENT

The 4 lighting fundamentals plus the 4 equipment fundamentals can be assured with Benjamin Floodlighting Equipment.

With Benjamin Units you can assure correct light distribution on vertical surfaces, and wide-spread lateral distribution combined with ample forward throw of light to reach across large areas. This three-way combination provides better uniformity and near-elimination of shadows.

Exclusive design features and Benjamin Built-like-a-Battleship construction assure ease of installation, simplified maintenance and long life. The heavy gauge steel reflectors are finished in Benjamin Lifetime Porcelain Enamel. This is the ideal reflecting surface for outdoor floodlights as it is immune to deterioration and corrosion from weather. Flint-hard, it cannot wear, scratch or become dull. Further, it is the easiest-to-clean light-reflecting surface, as simple soap and water washing quickly restores it to original light-reflecting efficiency.

To give intelligent counsel on Sports Lighting, you should be thoroughly informed about the details of floodlighting.

For a **FREE COPY OF BULLETIN FD,** which gives you complete description and specifications of Benjamin Floodlights, write to:
Benjamin Electric Mfg. Co., Dept. H, Des Plaines, Illinois.

You may also obtain **FREE SPORTS LIGHTING DATA SHEETS** *on any of these sports: Softball, Baseball, Football, Tennis, Golf, Swimming, Trap & Skeet Shooting and Shuffleboard. Please specify the material in which you are interested.*

BENJAMIN

Floodlighting and Sports Lighting Equipment

Distributed Exclusively Through Electrical Wholesalers

Bus Duct Distribution—Part II

Engineering data for bus duct layout, estimation, specification and installation are essential in selecting and planning an efficient industrial electrical distribution system.

By R. N. Blatchford
BullDog Electric Products Co.
Detroit, Michigan

UNDERSTANDING one another is one of the hardest, most confusing and time consuming problems with which we poor mortals must contend. This is especially true when individuals in scattered parts of the country try to convey their ideas on product application through the medium of written or spoken words. For, they often forget that "popular" definitions sometimes differ from dictionary, others may think in terms of archaic usage, also there exist differences of meaning for some terms in various areas, and to top everything, there always exists the possibility of just plain misinterpretation. All lead to misunderstanding and inefficiency when occurring between personnel in the field and factory.

Drawings are often used to clarify meaning and thus eliminate possibility of confusion or misunderstanding. But, to some extent, even drawings if left to the individual's ingenuity can be inefficient. For, while some people are "arty", others have difficulty in preparing just an ordinary drawing. The first group often makes drawings so elaborate as to be a work of fine art—and a fine waste of valuable time. The second tend to over-simplify, necessitating correspondence or telephone conversation to clarify intended meaning.

We, therefore, have developed a "standardized language" in the form of symbols to be used in the making of layouts, estimates and drawings of our products and their application. These symbols cover the complete bus duct line and yet are so flexible they permit considerable ingenuity. And, very important, they are so simple that with very little familiarization, they may be read rapidly and accurately. They enable factory and field offices to consistently and easily understand one another.

Development of appropriate symbols was a natural by-product of the introduction, general acceptance and diversified application of bus duct systems. Prior to bus duct, many component parts of electrical systems were not prefabricated or standardized, but cutting, bending, pulling of wires and other fabrication were accomplished at the job site of individual installations. As parts were not standardized and no one could predict before hand their contour or size, definite limitations were placed on the use of symbols. However, bus duct electrical distribution systems with every part standardized and prefabricated made development of symbols possible, practical and almost imperative for complete utilization of the system's inherent possibilities.

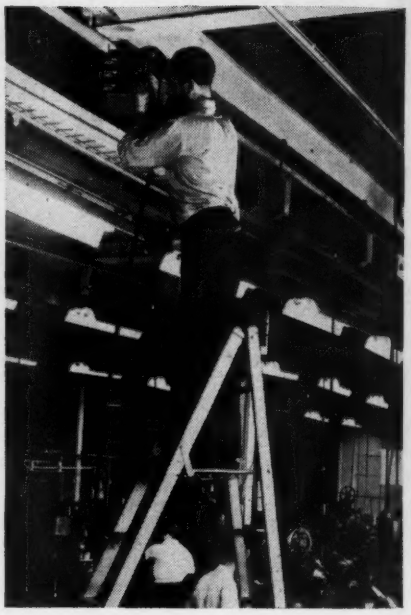
Although originally designed for use within the manufacturing organization, we recommend adoption of these sym-

TABLE OF SYMBOLS

Std. 10' Section (Plug-in)	P	Roof Flange		Circuit Brkr. Adptr. (Cubicle)	C
Std. 10' Section (Feeder)	F	Transformer Tap Opening		Section Bus Bar Adaptor	
Weatherproof Duct		Transposition		Bus Bar Extension	
Flanged End		Expansion Joint		Vacu-Break Plug	
End Closer		End Cable Tap Box		"BP" Plug	
Ebony End	E	End Tap Switch Box	S	Circuit Breaker Plug	
Panelboard Adaptor		Center Cable Tap Box		Circuit Master Plug	
Elbow		Plug-in Cable Tap Box		Capacitor Plug	
Tee		Plug-in Branch Run Adaptor		Grd. Detector Plug (Potentializer)	
Cross		Fusible Plug-in Br. Run Adptr.		Temperature Indicating Plug	T
Wall Flange		Fusible Switch Adptr. (Cubicle)	F	Transformer Plug	

FIG. 6—Use of manufacturers' standard single-line symbols simplifies layouts and aids in estimating the completed system. An added advantage is the reduced possibility of error.

Plug-in bus duct systems in large industrial plants provide for flexibility, convenience and adequacy of power. Interchangeable sections provide complete salvability, and frequent plug-in openings allow for rearrangement of equipment without altering the distribution system.



Steel-enclosed ducts provide maximum safety, and tap-off connections eliminate splicing and taping. Connections can be made without service break.

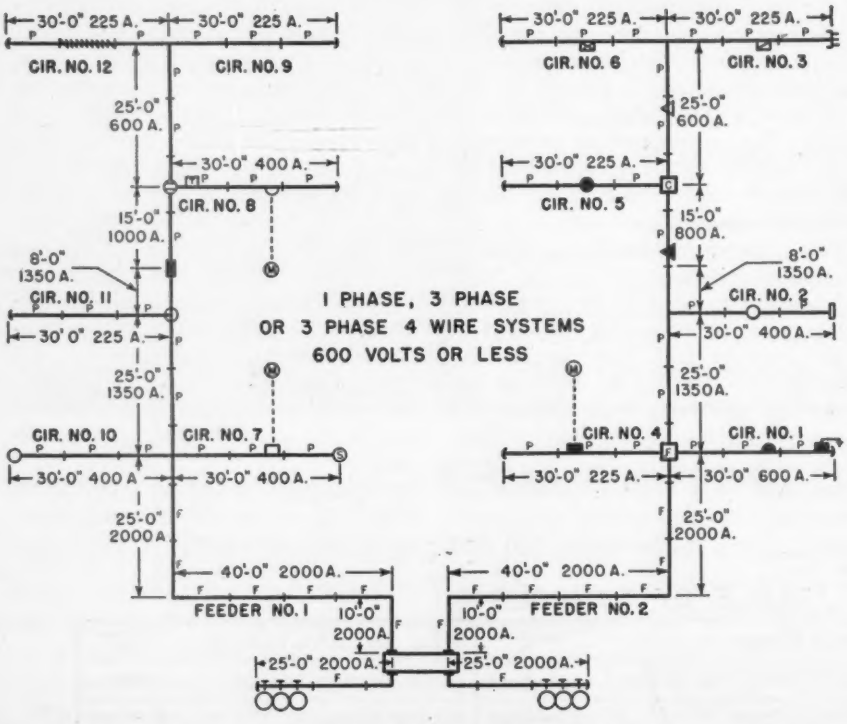


FIG. 7—The use of single-line symbols is illustrated in this layout diagram showing notation of duct sizes and footage of each circuit in the system.

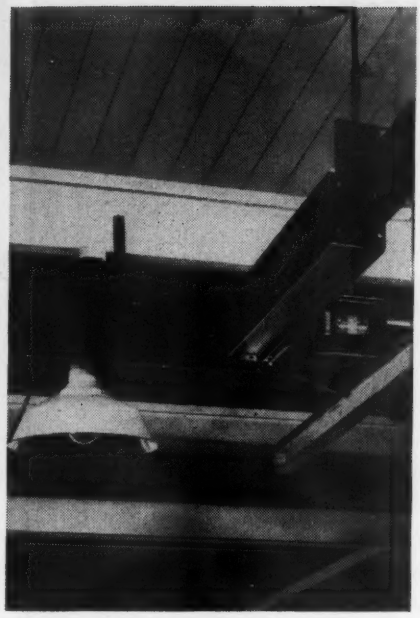
bols by all interested in saving time, effort and money in the design, estimating and layout of bus duct electrical distribution systems. The contractor or architect, for example, will take the precaution of using manufacturer's symbols. There are two very important reasons why they should be used. First, it is much easier than not using symbols or devising a new set. Second, use of manufacturer's symbols assures ready identification by factory of every part required and provides certainty of correct layout interpretation.

Architects and contractors are often called upon to lay out a distribution system from information obtained in manufacturers' catalogs. Since bus duct system layout varies with each individual job, all pertinent information should be checked with an engineer representing the manufacturer. This check is an act of insurance, for construction, dimensions and gauges of sections and fittings may have been changed without notice. His diversified experience puts the field engineer in position to offer practical know-how and frequently more complete or up-to-date information than found in existing catalogs.

Changes in copper conductor ampere ratings illustrate fluctuating catalog data. Performance characteristics of bus duct for each specific conductor size have, of course, remained the same but during the war emergency ratings were increased to effect savings in critical copper. These were later reduced in accordance with good engineering practice to form present recommendations.

Figs. 6 and 8 show the standard symbols used by our company. Through them field engineers (as well as architects, contractors, etc.) can accurately and quickly tell the factory the design and exact details of each job. Note that there are distinctive and unmistakable symbols for each section of duct (both feeder and plug-in) and for every fitting and plug, covering all products and possible applications.

Symbols in Fig. 6 are used in schematic drawings showing locations, capacities and lengths of duct runs and fittings. Symbols in Fig. 8 are more elaborate and make drawings of finer appearance but in most cases these are used only to show details such as variations in elevation of duct, ceiling height or structural details of



Standardized duct and fittings simplify storage and moving problems and save time. Plug-in openings provide power outlets as required.

building. Fig. 7 illustrates how finished layout drawings will appear. A bill of materials can be readily taken from these and accompanying building drawings and subsequent estimate of the job made.

When this information is received at the factory, it is necessary only to read the symbols and check bill of materials to know exactly what is to be furnished. Factory engineers can quickly verify the application of products to assure a well planned installation at an economical cost. Factory processing is accelerated and the possibility of error reduced.

Load characteristics, power factor, voltage drop, available short circuit power, suitable protection and other factors are all given careful consideration by factory engineers before a job is approved. For this reason it is essential that all pertinent information be included on or with layout drawings. Field and factory engineers must know the complete story before they can give full benefit of their knowledge and experience in modern electrical distribution. By using the Check List which appears on the following page, the possibility of omitting required details is reduced to a minimum.

Where total connected load is small, such as in smaller factories and repair shops, enclosed busbar systems with ratings of 200-amps. or less can be used, thereby retaining the advantages of the larger bus duct systems and also obtaining the values of smaller size and lower cost.

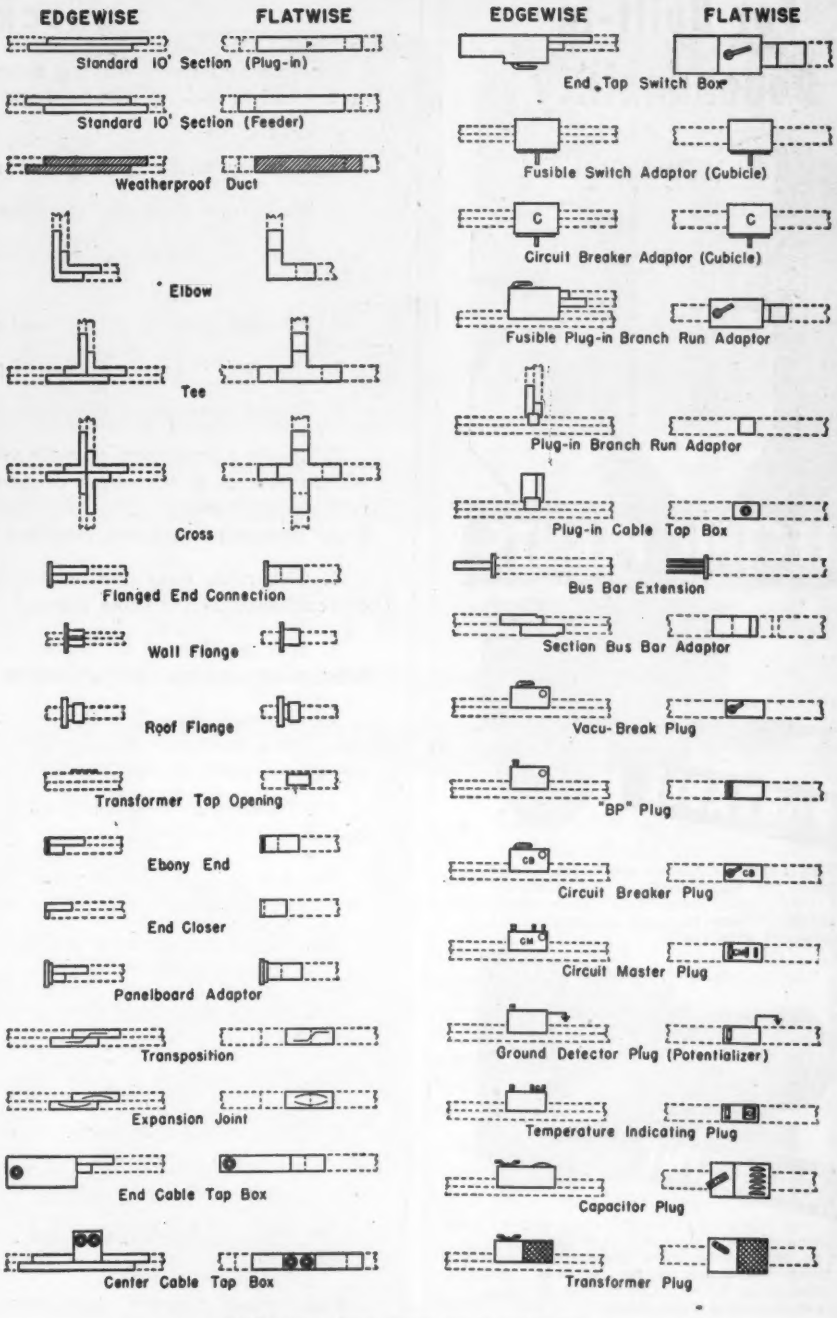
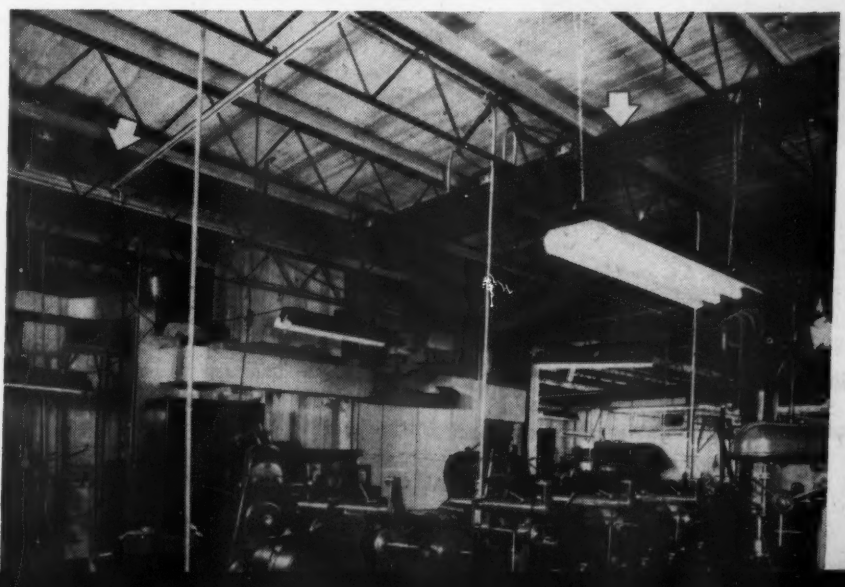
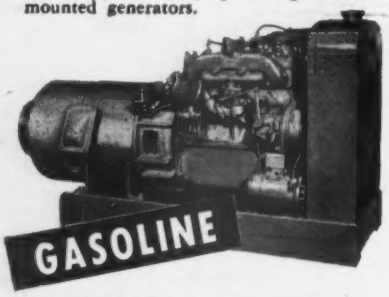


FIG. 8—Detailed symbols make for clearer understanding between architect or contractor and the manufacturer's factory. They also improve appearance of working drawings. Detailed symbols are particularly valuable when indicating changes in duct elevation, special offsets or unusual construction.

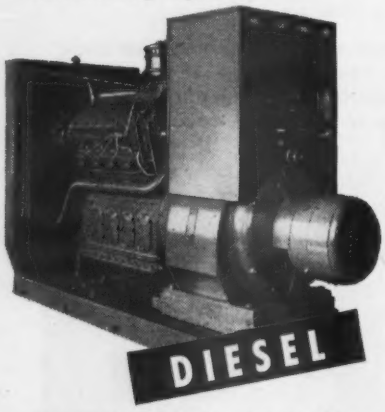


For Built-in Dependability

You'll find the correct on-the-job power plant for your needs in the *complete* "U. S." line: from small units easily carried by one man, up to large trailer mounted generators.



From ½ kw up — A.C. and D.C. You can recommend these units with complete confidence. Their "built-in" dependability is the result of over 40 years manufacturing experience.



2½ to 140 kw, A.C. and D.C. All are full diesel, compression ignition, solid injection type. Write for information Please state type and capacity in which you are interested.

UNITED STATES MOTORS CORP.
580 Nebraska St. Oshkosh, Wis.

CHECK LIST

The following check list will serve as a guide both in laying out the system and in making sure all important data is included.

1. Indicate the system (1 phase, 3 phase, 3 phase 4 wire, etc.) and voltage, giving feeder or plug-in duct designations.

2. Work from floor and elevation building plans.

3. Make use of standard symbols for both detail and single-line layout drawings.

4. Estimate greatest future load anticipated.

5. Show existing and anticipated power factor and demand factor.

6. Record transformer total kva. capacities and impedances.

7. Locate transformers or main switchboard in such a manner that they will be near or at the center of distribution. This makes possible shorter runs, lower resistance loss, minimized voltage drop and greater flexibility when changing equipment locations.

8. Give cable sizes and number of lugs per leg when cable and duct are combined in the same system.

9. Spot position of all motors if possible, giving motor capacities in horsepower and application (such as press, lathe, power punch, etc.)

10. Indicate type of motor such as squirrel cage, induction or synchronous. Also indicate type and load characteristics of any other electrical equipment (such as welders, ovens or furnaces).

11. Determine the best possible hanger arrangement and mounting facilities.

12. Locate duct so that motor branch circuit distances are 30 feet or less from the plug-in tap-off device to the motor location.

13. Where no elevation plans are available, designate risers or drops and indicate number of feet each extends.

14. Detail all unusual fittings such as special offsets, jogs or combinations of fittings.

15. Indicate type of building, such as steel truss, crane way or high bay, saw tooth, pitched roof, flat roof, flat roof beam, mill type with wood or reinforced concrete.

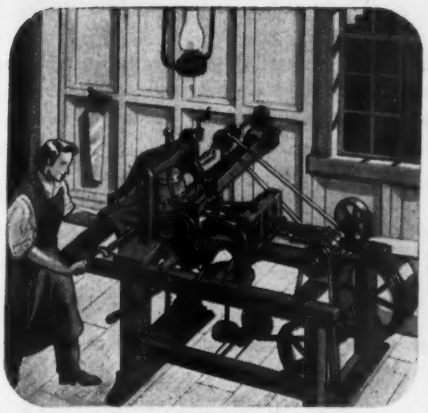
16. Where concrete in various forms is used, indicate steel pan, hollow tile, beam type and reinforcing.

17. Clear I-beams, pipes and other obstructions when passing through walls, floors and ceilings.

18. Where concrete, steel, wood or plaster must be broken through, mark plainly.

19. Expansion joints should be considered for bus duct runs exceeding 150 feet in length, and obviously must be provided wherever expansion joints occur in the building structure.

A complete line of auxiliary fittings makes it possible to design any installation in conformity with all building contours. For example: end closers are used at duct runs to enclose the bus bar ends, ebony end cover plates can be ordered with or without bus bar openings, transformer tap openings can be installed in the duct casing, bus bar extensions make it possible to extend bus bars beyond duct casings, and flanged end connections are designed to connect casings to switchboards. Non-fusible feed-in or tap-off connections at the ends of runs are possible by specifying end cable tap boxes, and similar connections for establishing connections in the center of a duct section or at some other intermediate position can be obtained by ordering center or plug-in cable tap boxes. Plug-in adapters make it possible to establish a branch circuit at right angles to feeder circuits at any plug-in opening, and expansion joints compensate for differences in expansion of steel casings and copper bus bars. This reference to auxiliary fittings, although incomplete, indicates the possibilities to be obtained by their use.



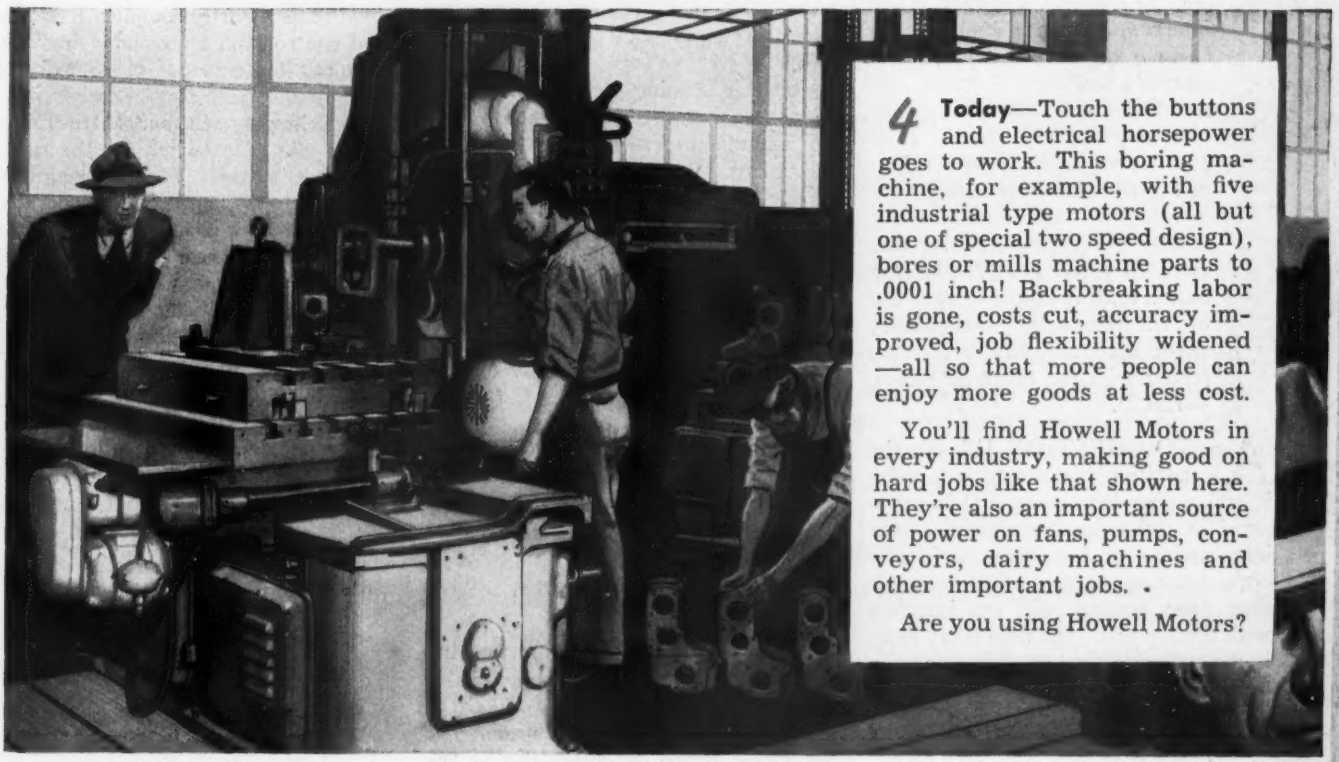
1 **1865**—Here's how machines looked before man applied electricity for industrial usage. Gear setups were crude. Making parts fit was a matter of luck and plenty of tinkering by operators.

2 **1907**—Electrical horsepower gave production a big boost. But gear mechanisms were far too cumbersome. Repairs were frequent. Men were still struggling to make one motor do the work of many . . .

3 **1915**—Howell "Red Band" Electric Motors arrived. These rugged, industrial type motors were specially designed to withstand hard usage. Soon, Howell Motors appeared in this and other industries.

NOW, IT'S TOUCH AND GO!

(and parts are machined quicker and to closer tolerances)



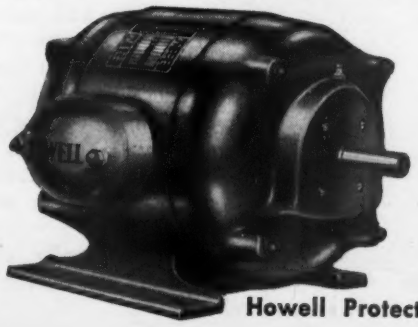
4 **Today**—Touch the buttons and electrical horsepower goes to work. This boring machine, for example, with five industrial type motors (all but one of special two speed design), bores or mills machine parts to .0001 inch! Backbreaking labor is gone, costs cut, accuracy improved, job flexibility widened—all so that more people can enjoy more goods at less cost.

You'll find Howell Motors in every industry, making good on hard jobs like that shown here. They're also an important source of power on fans, pumps, conveyors, dairy machines and other important jobs.

Are you using Howell Motors?

Free enterprise encourages mass production, supplies more jobs—provides more goods for more people at less cost.

Here's another precision-built Howell Motor . . . industrial type with copper or bronze bar rotors . . . specially insulated . . . statically and dynamically balanced.



Howell Protected Type Motor

HOWELL MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.

Manufacturers of Quality Industrial Type Motors Since 1915

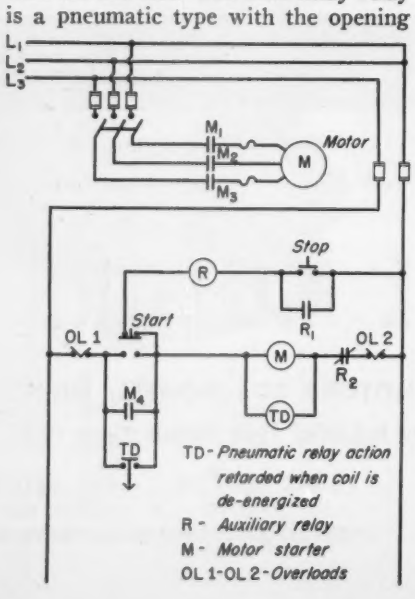
QUESTIONS from readers on problems of industrial equipment, installation maintenance and repair. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published, we pay $5.00.

Reader's Quiz

Life Test Motor

QUESTION 312—Due to rare but at the same time annoying power interruptions of two to ten seconds duration, usually at night, we have an important life test motor dropping out. Due to operation prcedure, it is important that this motor does not restart if power failure is longer than 30 seconds; however, if the interruption is less, it will do no harm if the motor stays on the line. An ordinary 3 phase 220 volt 20 hp. magnetic starter with start-stop button is used. Is it possible to rewind the holding coil of the starter or incorporate a relay in the circuit so the starter will hold for 30 seconds after the power is off? The stop button must continue to drop out of the contactor immediately when used, also without interfering with the overload relays. —L.R.D.

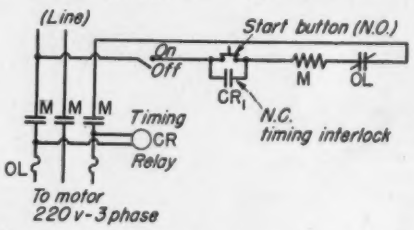
A. TO QUESTION 312—By the addition of an auxiliary relay R and a time delay relay TD incorporated in the following circuit, power interruptions of less than thirty seconds duration, or any other desirable time delay setting, will not interfere with the life test. The time delay relay is a pneumatic type with the opening of the TD contacts retarded until the TD coil is de-energized. All relays are shown in the de-energized position.—R.H.E.



A. TO QUESTION 312—Below is shown a regular (line diagram) push-button magnetically controlled motor with two exceptions. First for stopping we use an Off-On selector switch and in place of the regular "sealing interlock" connected across the start button, we use the normally closed contact of the "Timing Relay".

For this Timing Relay, many will do, as manufactured by the motor control manufacturers—the most economical being a simple oil dashpot type. (Time Delay after de-energization.)

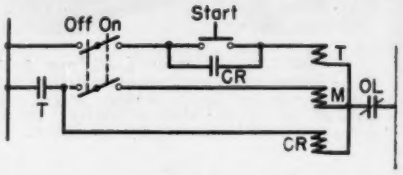
Upon starting motor you depress Start button which not only energizes motor but also Timing Relay which in turn "seals" the starting circuit making it a momentary start type button.



Now should the power fail "CR1" will remain closed up to 30 seconds so if the power comes on during that interval the motor will automatically restart. After 30 seconds, "CR1" would open and if the power came on, the motor would not automatically restart—in other words, you have "no voltage protection" after an interval of 30 seconds.

In order for you to have immediate stopping facilities—even within the 30 second period—we resort to a selector switch which is of the "maintained contact" type.—E.A.M.

A. TO QUESTION 312—The question states that a conventional start-stop pushbutton control is now used and it is desired to retain this. However, the use of this type control station, while important in some applications to prevent a restart on return of voltage to the lines, is apparently inapplicable here since a life test of a motor is involved, and further, an automatic re-start is indicated as desirable on return of line voltage in 30 seconds or less.



The "start-stop" button, if retained, would unnecessarily complicate the desired control and appreciably increase the apparatus expense for comparable results.

The following scheme, substituting a double pole snap switch for the start-stop push button, adding a magnetic relay, and a magnetically operated dashpot timer capable of adjustment to 30 seconds, or more, should meet the conditions outlined. The start button may be that available in the present control station; the stop button would be disconnected. Elements in scheme:

1. Double pole snap switch
2. Normally open push button
3. Control Relay
4. Main contactor on starter
5. Dashpot timer—contact normally open, but held closed when equipment is energized.
6. Overload relay contacts on starter.

Operation would be as follows:

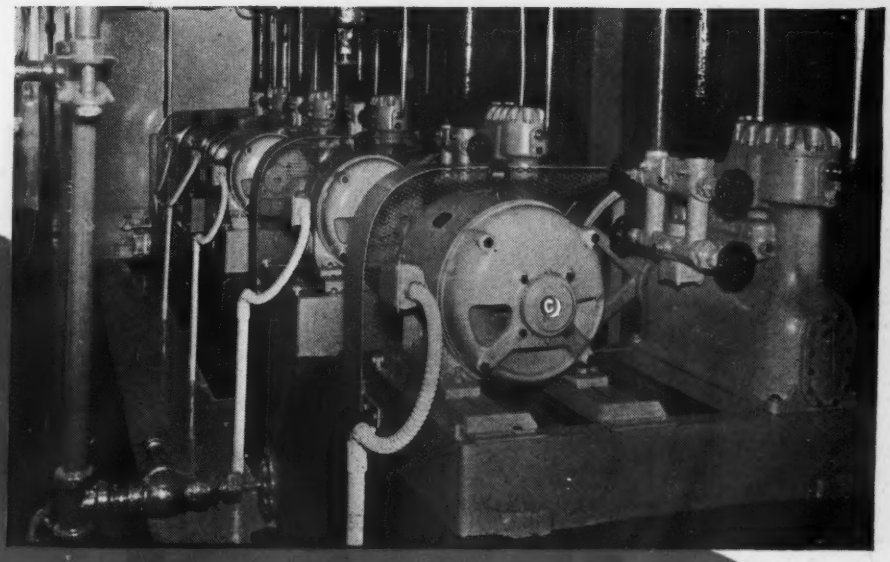
Press "on" button of snap switch. Close "Start" button to energize dashpot timer coil, T, which causes contact, T, to close. This picks up control relay, CR, and starter switch, M, to connect motor to line. The CR contact maintains voltage on the timer magnet coil.

When voltage fails, all operating coils are de-energized and the T contact will remain closed for 30 seconds. If voltage is restored in less than 30 seconds, the control relay and starter main switch will close to restart the motor, and energize the dashpot timer coil to reset the timer contact, T.

Should the period of no-voltage exceed 30 seconds, the timer contact, T, will be open and prevent re-establishment of any circuits until the start button is again pressed.

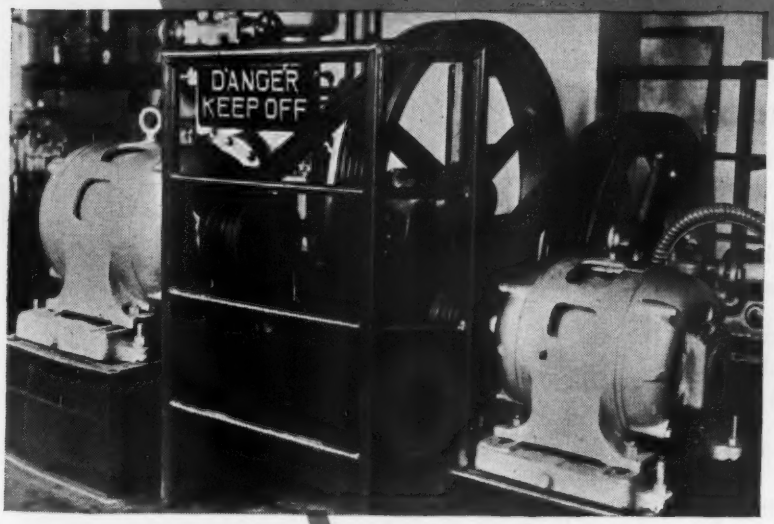
The equipment is normally shut down by pressing the "off" button of the snap switch.—K.E.L.

One each 5, 7½, 10 and 15 horsepower type SCH three phase Century motors drive compressors in a locker plant.



The High Starting Torque of Century Type SCH MOTORS

Assures Prompt, Quiet Starting of Reciprocating Refrigeration Compressors When Starting Under Load



Century 40 and 75 horsepower type SCH three phase motors drive compressors in a fruit warehouse.

Century type SCH 3 phase squirrel cage motors have sufficient starting torque to start heavy loads — with low starting current — without over-motoring the compressor. They come up to full speed quickly, yet smoothly and quietly.

They are unusually free from vibration and are ruggedly built for long satisfactory service, even under severe operating conditions.

You will find Century type SCH motors ideal for such hard-to-start loads as refrigeration compressors.

In addition, Century builds a complete line of motors in sizes from 1/6 to 400 horsepower to assure top performance for all popular applications.

Specify Century motors for all your electric power requirements.

Popular types and standard ratings are generally available from factory and branch office stocks.

CENTURY ELECTRIC COMPANY
1806 Pine St., St. Louis 3, Missouri
Offices and Stock Points in Principal Cities

585

"We Were Able To *Increase* The *Load* On A Bus Duct Without Changing Fuse Holders"

Simply by Installing

"In May, 1945, we moved considerable electrical equipment from a plant in Buffalo to a new plant at Niagara Falls. Several runs of bus duct were moved and installed with some load added.

"The fusible swing-out plugs in the bus duct system were 60 ampere capacity. It was soon found that 60 ampere ordinary fuses would not handle the starting surges or other temporary overloads caused by the additional equipment on the circuit.

"Our Electrical Engineer suggested Fusetron dual-element fuses. The troublesome, needless blows were stopped immediately.

"The Fusetron fuses permitted all machines to be kept in operation without any change in the size of the fuse holders."

Ferguson Electric Construction Co.,
Buffalo, N. Y.
C. P. Wachtel, Vice President

Facts About FUSETRON Dual-Element FUSES

The fuse link element opens on short-circuit — the thermal cutout element protects on overloads — the result, a fuse with tremendous time-lag and much less electrical resistance.

They have the same degree of Underwriters' Laboratories approval for both motor-running and circuit protection as the most expensive devices made.

Made to the same dimensions as ordinary fuses — fit all standard fuse holders.

Obtainable in all sizes from 1/10 to 600 ampere, both 250 and 600 volt types. Also in plug types for 125 volt circuits.

Their cost is surprisingly low.

FUSETRON is a trade mark of the Bussmann Mfg. Co., Division of McGraw Electric Co.

Fusetron DUAL-ELEMENT Fuses

with their

10 Point Protection

1. Protect against short-circuits.
2. Protect against needless blows caused by harmless overloads.
3. Protect against needless blows caused by excessive heating — lesser resistance results in cooler operation.
4. Provide thermal protection — for panels and switches against damage from heating due to poor contact.
5. Protect motors against burnout from overloading.
6. Protect motors against burnout due to single phasing.
7. Give DOUBLE burnout protection to large motors — without extra cost.
8. Make protection of small motors simple and inexpensive.
9. Protect against waste of space and money — permit use of proper size switches and panels.
10. Protect coils, transformers and solenoids against burnout.

Stop Wasting Time and Money —

FUSETRON
TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION
BUSS

FUSETRON Dual-Element Fuses Give ALL-PURPOSE PROTECTION

One needless shutdown — or one lost motor — or one destroyed switch or panel — may cost you far more than replacing every ordinary fuse with a FUSETRON Dual-Element fuse.

Don't risk such losses — protect yourself by installing a FUSETRON Dual-Element fuse in every set of fuse clips throughout the entire electrical system.

Bussmann Mfg. Co., University at Jefferson
St. Louis 7, Mo. (Division McGraw Electric Co.)

Please send me complete facts about Fusetron Dual-Element Fuses.

*Name*_____

*Title*_____

*Company*_____

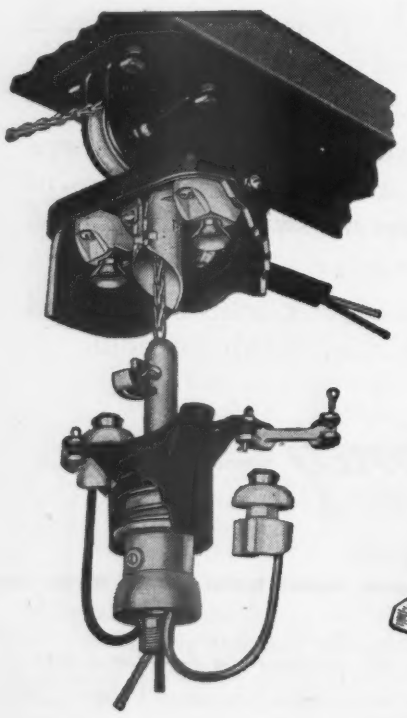
*Address*_____

*City & Zone*_____ *State*_____

EC&M-4-49

You can clean, maintain and relamp your High Bay Lighting Fixtures CHEAPER with Thompson Disconnecting and Lowering Hangers.

We invite you to use our engineering service.



THOMPSON
DISCONNECTING & LOWERING
HANGERS

THE THOMPSON ELECTRIC CO.
1101 POWER AVENUE • CLEVELAND 14, OHIO

A. TO QUESTION 312—The problem that you mention is one that has appeared in connection with the operation of electronic mercury vapor rectifiers. Small standard time delay relays are available from any radio parts distributor that will do the job. If none are suitable, a small unit can be built to do this job nicely. All that is required is a resistor of approximately 10 watts rating and a thermostat of the Klixon type. For example, at 110 volts, a 2000 ohm. resistor will draw approximately 6 watts and if placed in a small well legged cabinet or box, should provide sufficient heat to operate the thermostat. Depending upon the lagging, the unit will cool down more or less quickly, and thus cause the thermostat to operate. Some experimentation will be required to obtain the optimum size of resistor and cabinet, but the overall cost will be extremely small.

Other relays are available operating on hydraulic principles, but these are usually more expensive—H.H.S.

A. TO QUESTION 312—There are a number of hook-ups which L.R.D. could devise to insure that the holding coil of his 20 hp. magnetic switch will remain energized for any short period of time he may desire when power interruptions occur. One method which is definite and positive is to arrange a double throw, double pole relay in the wires which go to the holding coil, this relay to be energized by the 220 volt supply line. The normal position would be as now connected. Interruption of the power supply would operate the relay, throwing the coil onto a source of energy consisting of a small set of condensers which are, in turn, charged by a dry type rectifier power from the motor side of the magnetic switch. By proper choice of condensers, a current discharge rate can be determined which will supply a holding current for any short period.—W.B.M.

A. TO QUESTION 312—To obtain a simple yet effective method of the desired results, suggest that the present start-stop push button station probably of the momentary type be replaced with a start-stop pushbutton station of the permanent or holding type.

With this arrangement, when the start button is pressed, the start contact will hold in mechanically and electrically, until the stop button is pressed manually. This will provide one part of the hold-in feature necessary for the holding coil of the starter to become re-energized automatically after power is resumed following interruption. This start contact of the permanent type push button station

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Your Nearest IWI Warehouse Is A Department Store Full Of Motor Repair Materials. Stocks Of All These Items Are Ready For Shipment:

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- Asbestos Insulation
- Woven Glass Insulation
- Pressure Sensitive Tape
- Cotton Tape
- Cotton Sleeving
- Commutators
- Carbon Brushes
- Shop Equipment

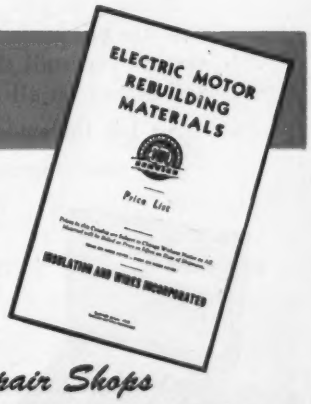
Keep your money in the bank—not on your shelves, tied up in stocks of seldom-used materials and parts. You can always get—at no extra cost—whatever you need, when you need it, from IWI.

IWI One-Stop Shopping gives you plenty of other benefits too—

IWI GIVES YOU SERVICE
IT'S LIKE HAVING A FULLY STOCKED WAREHOUSE NEXT DOOR!

- *One order to IWI eliminates orders to dozens of different suppliers.*
- *You get only one invoice, pay it with one check, and cut bookkeeping to a minimum.*
- *You save many wasted days of waiting for factory shipments. IWI helps you put motors back in service quicker.*
- *You save many dollars every year on shipping charges.*

GET YOUR COPY TODAY!
IWI BLUE CATALOG



In it is listed practically everything you will ever need for motor rebuilding — materials, tools, machines — indexed for quick finding, priced for easy ordering. Your request on a postcard will bring your copy FREE.

Service Headquarters For All Motor Repair Shops

INSULATION AND WIRES INCORPORATED

ATLANTA 2 · BOSTON 20 · DETROIT 2 · HILLSIDE, N. J. · HOUSTON 3 · LOS ANGELES 21 · PORTLAND 14, ORE. · ST. LOUIS 3 · SAN FRANCISCO 3

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to cut job costs

with the new

SIZE 8U ROTARY ELECTRIC IMPACTOOL

Rated capacity ⅝" bolt size

Not eleven tools to do eleven jobs—but eleven tools in *one*—a real multi-purpose tool—an engineering marvel made possible by the amazing power produced by thousands of rotary impacts.

There is no kick or twist even on the toughest jobs—motor burn-outs are eliminated because the motor continues to run smoothly even if you stall the spindle completely—and you will save time and money on all operations—nut running as much as 90%.

An I-R Impactool pays for itself in 30 days with normal use.

Ask your Ingersoll-Rand distributor for a demonstration,

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ORIGINATOR OF IMPACTOOLS—air and electric

KIT No. 1–IMPACTOOL, with standard equipment, plus a complete assortment of attachments in a Handy De Luxe Case
110 V or 220 V, AC or DC models available

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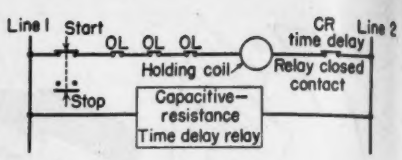


should be wired in series with the overload contacts and the holding coil.

The remaining part of the proposed arrangement and the one which would allow the holding coil of the starter to automatically become energized after an interruption of power less than 30 seconds, but not more than 30 seconds is a capacitive-resistance type time delay relay containing a normally closed relay contact which can be set to open at a setting of 30 seconds.

This normally closed contact should also be connected in series with the holding coil of the starter as shown.

The capacitive-resistance time delay relay which can be obtained from any one of several leading electronic equipment manufacturers operates on the principle of the time delay of discharge current of a condenser through a resistor in parallel with it to allow an electronic tube to conduct and operate a relay in its plate circuit.

The normally closed relay contact shown in the diagram is a contact on this plate relay.—R.K.H.

Light Bulbs Burning Out

QUESTION 313—We have a section in our plant that is particularly bad for burning out light bulbs. The voltage has been checked at various times and found to be within the specified voltage range of the lamps. This does not involve any one complete circuit but may be just a couple of lights per circuit. Has anyone had any similar experience or could they suggest what might be the trouble?—F.F.

A. TO QUESTION 313—I believe your trouble is due to vibration. Quite often certain locations may be subject to vibration that may not show up in other locations. The vibration may not be noticeable, but still be sufficient to damage regular lamps. I suggest you try some special vibration resisting lamps in your bad locations and check results. Most any standard lamp manufacturer can supply you with vibration resisting lamps. —L.R.B.

A. TO QUESTION 313—I have found a condition where the neck of the bulb, at the point where the screw base is attached, comes in contact with the porcelain on some types of sockets. When the bulb gets hot,

Wagner Motors on the job . . .

16,000,000 Cubic Feet of Air Conditioned Comfort

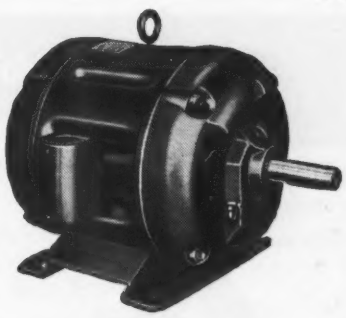
The Kansas City Municipal Auditorium, with enough space to comfortably accommodate 40,000 people under one roof, is equipped with a huge air conditioning system that supplies 1,800,000 cubic feet of cooled air per minute! The giant "weather plant" ranks among the largest in the world.

The air conditioning engineers who installed this system *know* that the plant can function properly only if it is equipped with dependable, efficient motors. That's why you'll find Wagner Motors on this job—and on thousands of other commercial, industrial, and home installations—Wagner Motors *are* dependable.

Wagner builds motors in types and sizes for a wide range of applications. Whatever your motor needs may be, you'll like the performance of Wagner Motors.

BUYERS OF WAGNER MOTORS GET NATIONWIDE SERVICE! More than 450 Wagner Authorized Electrical Service Stations and Parts Distributors augmented by 25 Wagner-owned Service Branches are ready to immediately supply on-the-spot service, factory guaranteed exchange motors, or genuine Wagner parts. Write for Bulletin MU-24 for complete list.

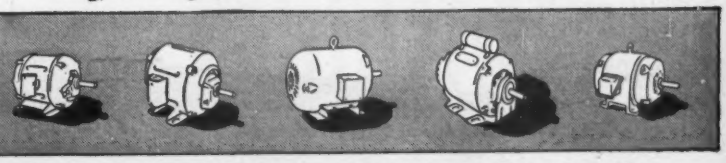
Wagner Electric Corporation
6413 PLYMOUTH AVE., ST. LOUIS 14, MO., U. S. A.



This steel-frame polyphase motor is typical of the Wagner line of singlephase and polyphase motors. Choose a Wagner Motor for your next installation. Bulletin MU-185 gives information on the complete line of Wagner Motors.

Consult Wagner Engineers on all Electric Motor Problems

Wagner Electric Corporation EST. 1891



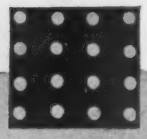
M49-4

• ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE PRODUCTS •

GREAT BIG CARBON BRUSHES

AND SMALL ONES

"Superior" APPLIES TO ALL!



VERY SMALL CONTACTS AND LARGE ONES

Above — possibly the largest brush yet made. *Below* — silver contacts about the diameter of a pencil lead. They all bring you a 29-year intimate acquaintance with electrical conditions — a willingness to ferret out your needs down to the last ampere — research and manufacturing facilities which will give you the *one right product* for your purpose. *Superior* brushes and contacts will always be worthy of the name.

Ask For Our Bulletin C-4

SUPERIOR CARBON PRODUCTS, INC

9113 GEORGE AVENUE • CLEVELAND 5, OHIO

"Since 1919" SUPERIOR CARBON BRUSHES

Lay that Ladder Down!

KETT TALL REACH WOOD BORER

DRILLS HOLES HIGH . . . LOW or in the HARD CORNERS

This sensational new tool pays for itself (users report) on the first two or three construction jobs. Drills holes through joists, concrete or steel. 11/16", 12/16" or 16/16" and expansion bits with range from 7/8" to 2 3/4" are available. Exclusive all-angle head permits drilling extremely close quarters in any direction. Use for wiring, plumbing or heating installations. No ladders, no more reaching, stretching and straining. Can be furnished with or without adjustable extension.

WRITE FOR BULLETIN No. F-4

The KETT Tool Company

5 E. THIRD ST., CINCINNATI 2, OHIO

uneven expansion causes the glass at this point to crack, allowing air to enter the bulb and burn the filament. The inside of the bulb usually has a milky appearance under these conditions.—W.W.M.

A. TO QUESTION 313—The main reasons why lamps burn out before their expected life are; excessive voltage, mechanical shock. If as is mentioned in the query, the lamps only fail in a portion of the circuit and in the rest of the circuit, operate satisfactorily, the answer is therefore not electrical but mechanical. In all probability the lamps are close to some vibrating machinery, or on a beam that is carrying a vibrating machine. I would suggest using some form of mechanical shock mounting for the lamps.—H.H.S.

A. TO QUESTION 313—While more detail regarding the type of fixture and method of installation would be desirable, it is almost certain that the individual lamp failures referred to are the result of vibration transmitted from the building to the lamp filament.

This vibration usually results from some running machinery, and may scarcely be noticeable to the touch. It is a matter of period and amplitude in relation to the filament suspension.

If a clear lamp is installed in a fixture where lamp failures are particularly high, and the filament is inspected with the aid of a magnifying glass from time to time prior to failure, it will be found that some of the filament turns are fused together. This reduces the effective resistance of the lamp, and the consequent abnormal current soon burns the filament off at a point of high temperature.

If the condition were general, it would be advisable to install anti-vibration devices at each fixture. These are a standard product of many fixture manufacturers. Two types are available, one is placed between the fixture and its connection to the lighting system, the other is incorporated in the fixture.

In the case of isolated failures it is a very simple matter to change the vibration period. If the fixture is rigidly mounted, dampen it by inserting about a quarter of an inch of fairly resilient rubber at the point, or points, of fixture support. If the fixture is at the end of a piece of unsupported conduit, a helical spring placed lateral to the fixture will dampen the vibrations very effectively.

In some cases, the use of railway lamps is justified, in others rough service lamps are satisfactory. It should also be noted that with certain types

Get CORRECT CONDUIT CONNECTIONS

The easy economical way

Cross Section Showing Indentations

• NEATER • STRONGER • FASTER • APPROVED

All B-M Fittings Carry the Underwriter's Seal of Approval and Canadian Standards Ass'n Approval No. 9296

Select the best, insist on Briegel All Steel Fittings, the original approved Indenter type connectors and couplings for thin wall conduit tubing. You will not only find that Briegel Indenter Fittings are easier and faster to use, but also make neater, stronger connections, the correct connections. Two Easy Squeezes and they're set. Start using Briegel Fittings today. Have more satisfied customers—more profits from each job.

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BRIEGEL METHOD TOOL CO.

GALVA, • ILLINOIS

Silicone News

DC SILICONES

Silicone Insulation Gives 200 Times Class "A" Life in Tread Cutter Motors

Lake Shore Tire and Rubber Specifies Silicone Insulation for Critical Motors

Case histories from all fields of industry prove that Dow Corning Silicone (Class "H") Insulation pays remarkable dividends. The initial cost of rewinding a motor with Silicone Insulation is about twice the cost of a conventional rewind job but Silicone Insulation lasts 10 to 200 times as long. The increase in production that comes of continuous operation is a bonus paid by Dow Corning Silicones.

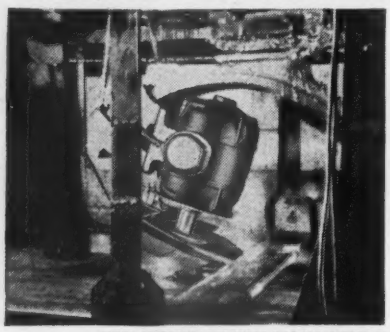

PHOTO COURTESY LAKE SHORE TIRE AND RUBBER CO.

Rapidly reversing tread cutter motors rewound with Dow Corning Silicone Insulation have more than 200 times the life of Class "A" motors.

At Lake Shore Tire and Rubber Company of Des Moines, Iowa, open type 2 h.p. motors are used to drive disc cutters that scarf cut tread stock into lengths. These motors reverse 12 times per minute and operate in a mist of the water used to lubricate the cutters. Life of Class "A" motors in this service ranged from 4 days to a few weeks. Production suffered and maintenance costs were abnormally high.

Lake Shore's electrical maintenance engineers had these motors rewound with Silicone Insulation over 2 years ago. They have already given as much as 200 times the service life of Class "A" motors. This proof of Silicone economy convinced Lake Shore engineers that DC Silicone insulated motors should be used in other essential production equipment such as McNeil Vulcanizers and Banner Bias Cutters.

Here, as in any production plant, Dow Corning Silicone Electrical Insulation greatly increases the life and reliability of hard working motors and motors on which production schedules depend. For more case histories write for pamphlet G7K4.

DOW CORNING CORPORATION
MIDLAND, MICHIGAN

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In Canada: Fiberglas Canada, Ltd., Toronto
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Dow Corning
FIRST IN SILICONES

of lamps, the mounting position is specified and must be adhered to if rated life of lamp is desired.

A very interesting case in the writer's experience was that of a 200 watt fixture in service for about twenty years and giving a lamp life well above the manufacturer's rating. Suddenly, the lamp life in this fixture dropped to twelve hours or less. This went on for a week or so while the possibility of defective lamps or injury was considered.

Investigation resulted in tightening nearby conduit straps, and inserting a rubber pad where the fixture was secured to the structure. This cleared up the trouble completely. Many similar cases could be cited.—R.J.

Can you ANSWER these QUESTIONS

QUESTION S14—In a 3 phase, 2 speed, 2 winding motor, both windings are connected 2 circuit wye. While one winding is in use, why doesn't the other act as a closed secondary?—F.H.

QUESTION T14—We have experienced a considerable number of failures in 110 volt, 60 cycle, single phase motors of the split phase type in which the starting windings are burned out due to mechanical wear of the starting switch. These motors have been protected only by the usual 15 amp. fuse on the branch circuit which apparently is heavy enough to cause the coils to burn out.

We have considered the use of Klixon protectors, fusestats and switches with heat coils. What is the most practical type of protection for these motors which have not had it applied at the factory?—W.D.R.

QUESTION U14—Some time ago, we purchased additional transformers. They are of subtractive polarity. All our old ones were additive polarity. At that time, I was told that they could not be grouped together unless they were changed internally.

I have asked several electrical engineers and they said they couldn't say for sure, but they thought they could be grouped together with the external connections but none could say for sure.

Can they be grouped together externally or do they have to be reconnected internally?—A.T.

PLEASE SEND IN YOUR ANSWERS BY MAY 15

NEW!

Non-Inductive Conductor Racks

Racks available for any number of cables—cable sizes 5/16" to 2⅝"

• Available in types for any number of cable, the M & W Types S-L Conductor Rack is designed so that cables are only partially surrounded by metal. This prevents induced current—permits the rack to be used for A.C. or D.C. systems. Simple design makes for quick, easy mounting of cables.

Write today for Bulletin C-5-51 . . . contains full information on M & W Non-inductive Cable and Conductor Racks.

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ILSCO
Electrical Connectors

MANY TYPES AND SIZES
WRITE for 54-page illustrated catalog.

ILSCO COPPER TUBE & PRODUCTS, Inc.
CINCINNATI, OHIO

LUSTRON INSTALLS ELECTRIC FURNACES

[FROM PAGE 83]

Lustron parts vary in area from a few square inches to the size of a bathtub, and in weight from a few pounds to more than one hundred.

Incorporated in the new Lindberg furnaces is a traveling thermocouple arrangement designed by Wheelco Instruments Company. Traveling through the furnace chambers with the ware, the thermocouples measure ware temperatures simultaneously at three horizontal levels. The temperature curves are electronically recorded on the illuminated charts of Wheelco "Capacilogs," which are electronic direct-reading strip chart recorders.

Temperature Control

In order to insure overall temperature uniformity, both the Lindberg furnaces have 32 separate zones of control. Each of the zones is governed by means of a Wheelco "Multronic Capacitrol", an indicating, controlling pyrometer with dual electronic circuits. The Multronic Capacitrol operates through a Wheelco automatic positioning type "Inputrol" to govern banks, and zones of heating elements, insuring a proper and uniform temperature gradient.

Another unusual feature of the Lindberg electric furnaces is a two-stage "kinetic air plug" located at both the entrance and exit ends. These "kinetic air plugs" are simply two vertical-moving, separate, recirculating streams of air which serve to prevent cross-draughts and to minimize convection heat losses.

Electricity thus plays a major role in both the compactly-designed five-room Lustron home, and in the Lustron plant of over a million square feet which turns out the houses on an assembly-line basis. Lustron built a sub-station and installed a 15,000 kva. transformer in order to furnish electrical energy for the entire plant, much of which is used by the two large electric furnaces, each rated at 2500 kva.

Roof construction for the Lindberg porcelain enameling furnaces was handled by Albert J. Boland Co. Burning tools were specially designed and constructed by The Fahralloy Co., in conjunction with Lustron engineers.

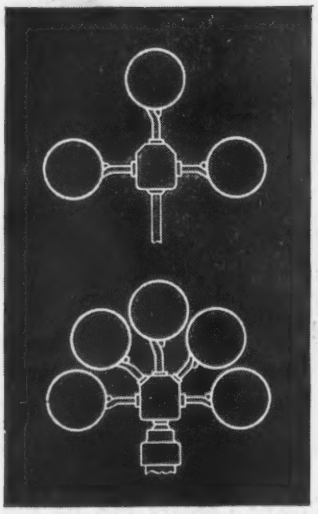
Working in close cooperation with Lindberg engineers on the design of these two furnaces were engineers from Chicago Vitreous Enamel Product Co., A. J. Boynton Engineering Co., and Lustron Corporation. . . .

BIG NEW LIGHTING MARKET

Steberlite Floodlamp Holder S 300 for 150-W PAR 38 and R-40 lamps: can be installed on conduit fittings, wall brackets or pole slip fitter.

FOR THE HANDY STEBERLITE

Service stations are just one of the many prospects for economical new Steberlite spot and floodlighting complete units. Other big markets are playgrounds, camps, parking lots, business areas, motor courts, gardens, sport and amusement centers.



By use of Adapter Box No. S 301, clusters up to 5 Steberlites can be quickly assembled as one unit and this in turn fitted to 1½" or 2" pipe or for direct connection to conduit.

Easy to Install—Weatherproof

Steberlites are complete units and do not require other special small parts. They save labor and wiring costs, and can be mounted singly, in pairs, or clusters of 3, 4, and 5. Very compact, sturdily constructed and completely wired, they are ready for quick assembly and installation, indoors or out.

Few Parts to Stock

Steberlites can also be used for directing special attention to displays, buildings, entrances and statues. A few basic units take care of most needs; and a small inventory does a big profit job. Steberlites are sold through leading Wholesalers.

Write for interesting new Bulletin 120.

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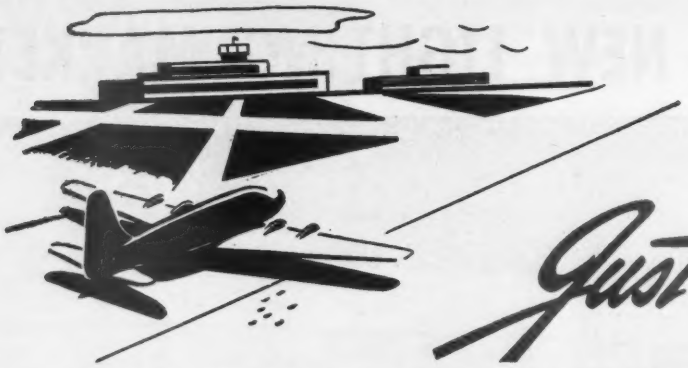
STEBER MANUFACTURING CO.

Dept. 70, 2700 Roosevelt Road, Broadview (Maywood P. O.), Illinois

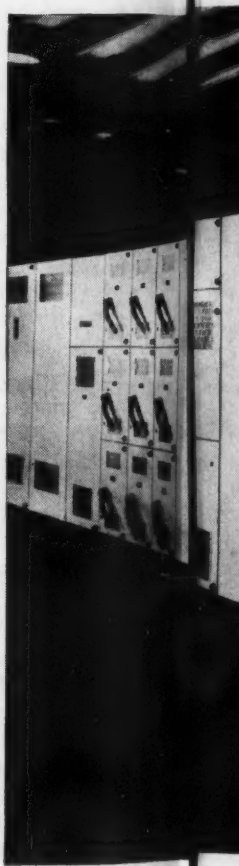


Just an example

BUT...IT'S POWER DISTRIBUTION AT ITS BEST!

. . . just a Dry-Type Power Center installed in a large eastern airport. The thousands of people who land and take off never see it. Yet, their very lives depend on it *and* the Power Distribution System of which it is a part.

These modern Dry-Type Power Centers are a part of the Spot Network System equipped by Westinghouse . . . a system chosen because reliability of service was of the utmost importance. Every vital operation of the airport depends on this reliability . . . from ground control approach equipment to crash and fire alarm system.



Modern Dry-Type Power Centers were chosen to assure Reliable and Economical distribution of power...

and here's why . . .

- Fire and explosion proof
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- Positive interlocking
- Draw-out circuit breakers quickly inspected
- All parts readily accessible
- Lighter in weight
- Installed as a unit
- "Unitized" design saves valuable floor space
- Factory assembled and tested . . . as a *unit*
- Undivided responsibility for manufacture and correct functioning of all equipment

Modern Westinghouse Dry-Type Power Centers can be supplied for use in any distribution system, whether radial or network . . . where the high voltage is 15 kv and below. CONSULT WESTINGHOUSE. Call your nearest Westinghouse office or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

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Yes . . . Every Industry's Problems ARE Different!

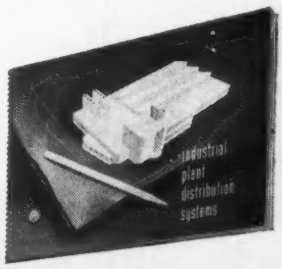
Nothing is more vital to industry than the Power Distribution Systems that provide the power for its machines. Thus, it is most important that the *best system* be selected and included in the basic planning for expansion or new building.

These problems vary greatly from industry to industry . . . from plant to plant. Meeting these problems for widely diversified industries has given Westinghouse an intimate knowledge of fields that undoubtedly closely touch *your* problems.

We can help *you* find *your* answer. New ways of distributing power to economically provide better voltage regulation, greater reliability, greater safety . . . these are a few of the problems for which our engineers have found new and better solutions.

★ ★ ★

Write for the new booklet *"Industrial Plant Distribution Systems"*. You'll find the fact-filled pages invaluable in choosing a power distribution system that best meets *your* requirements. Ask for B-4045.



YOU CAN BE SURE..
IF IT'S
Westinghouse

One of the modern Dry-Type Power Centers installed in a large eastern airport. It consists of two primary selector switches, two dry-type transformers, two network protectors and low-voltage circuit breakers.

MODERN EQUIPMENT FOR MODERN DISTRIBUTION SYSTEMS

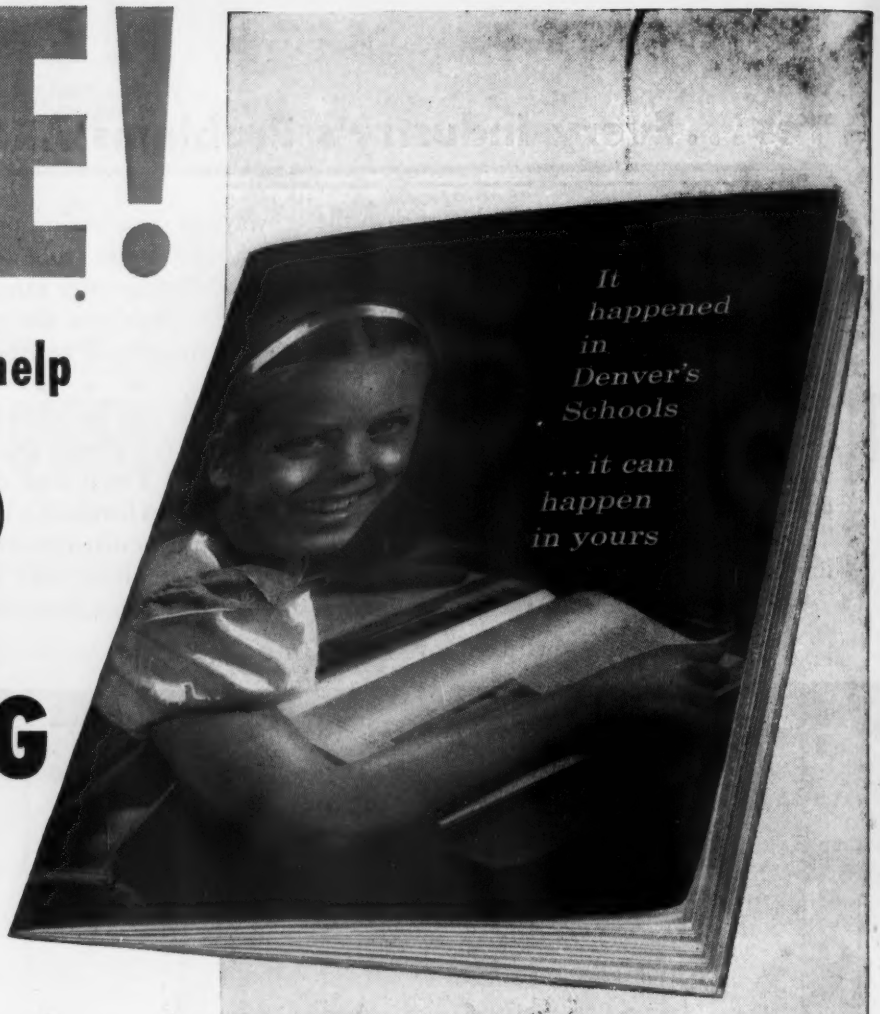
FREE!

New Booklet to help you sell more (and better)

SCHOOL LIGHTING

16 pages of facts and photos

FREE . . . all the copies you need



Here's a real selling tool . . . an easy-to-understand booklet that points out the need for better school lighting—then *shows what steps can be taken to get a school lighting program started.*

Put this booklet to work for you. Send it to educators, parents, PTA members—all the many hard-to-reach people who must support a school lighting program. *Not fixture advertising!* This is an understandable, objective case history of a planned school lighting program that will help overcome that "What can we do about it" public indifference. Let it help you SELL school lighting . . . the need for it . . . how to get it.

150

IT'S EASY TO SEE WHEN IT'S

DAY-BRITE *Lighting*

Day-Brite fluorescent fixtures are engineered for every seeing task. Distributed nationally by leading electrical suppliers.

Authoritative **because it's an actual account of how the citizens of Denver, Colorado, completely relighted their Public School buildings.**

Fact-filled **— step-by-step through the Denver story — answers such questions as:**

- ○ **What's a good way to get started?**
- ○ **Who can help?**
- ○ **What is the best lighting layout?**
- ○ **How does color of paint affect lighting?**
- ○ **What about new wiring?**
- ○ **What about maintenance?**

. . . and many, many others.

. . . as many copies as you need . . . courtesy of Day-Brite! Clip and mail coupon—TODAY!

To: DAY-BRITE LIGHTING
5402 Bulwer Avenue, St. Louis 7, Missouri
In Canada: Amalgamated Electric Corp., Ltd., Toronto, 6, Ont.

Please send me, free and postage prepaid, _____ copies of your new booklet, "It Happened in Denver's Schools." I understand there's no obligation.

Name (Please Print) _____

Address _____

City _____

State _____

Modern Lighting

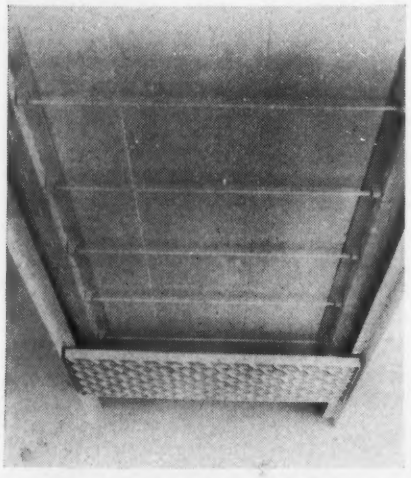
Louverall Ceilings Light Classrooms

Two schools in Park Ridge, Illinois, have set new standards for school classroom lighting. These are the Lincoln and Roosevelt Schools, District No. 64. These new standards comprise 72-inch T-6 Slimline lamps installed above metal louver ceilings of sinusoidal cellular design, varicolored pastel tone walls, bleached woodwork and desks, and light tile floors, all having high light reflection values.

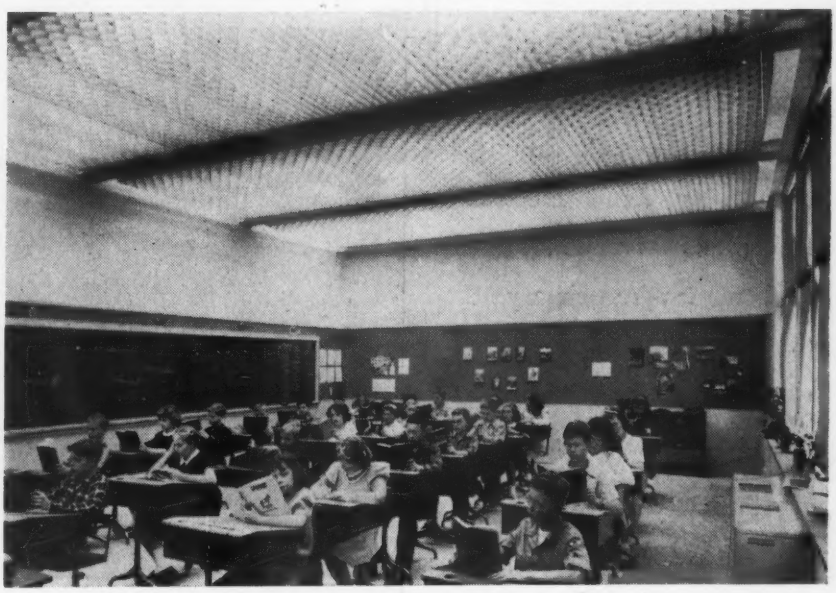
Designed by Larry Perkins and Phil Will, Chicago architects, these installations were made only after much research, tests and study. Cooperating in this research were L. V. James, Lamp Department, General Electric Company, and John Goehst, Federal Electric Company.

Each classroom is 23 feet 10 inches by 34 feet 9 inches. Three beams divide the ceiling into four equal bays. These four bays are covered with metal louvers made of venetian blind steel. These louvers have a cutoff of 22 degrees at the point where the cells join, and of 40 degrees perpendicular to the lamps. Nine louvers, each 30 inches by 84 inches, are installed in each bay, providing a total of 36 louver sections in each classroom.

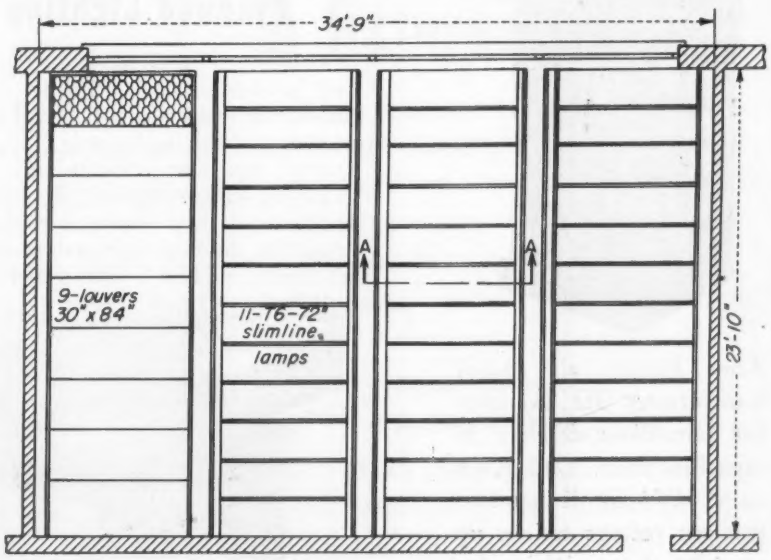
The ceiling above the louvers serves as a reflector. It is painted flat white, and has a reflection factor of about 85 percent. In each bay are installed



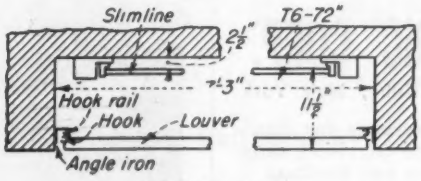
Venetian blind steel louvers are installed 11½ inches below 72-inch T-6 slimline lamps. Each louver is 30 inches wide by 84 inches long.



Louverall ceilings light classrooms in Lincoln and Roosevelt Schools, District No. 64, Park Ridge, Ill., to maintained intensity of 55 footcandles. Brightness ratios are within a 3-to-1 range, except for slate blackboards.



PLAN VIEW

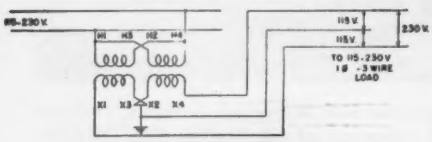


SECTION A—A

The ceiling in each classroom is formed by four bays of louvers, installed flush with the bottom of cross beams. Section A-A shows installation details.

HOW TO PROVIDE A 3 WIRE 115/230 VOLT CIRCUIT FROM A 2-WIRE PRIMARY

No need to rewire a job when you need a 3-wire 115/230 volt circuit. Simply connect an Acme Electric air cooled power transformer to the 2-wire primary at the most convenient location and you're all set for 3-wire 115/230 volt service.



Acme Electric air cooled transformers are available for immediate delivery in capacities from 1/10 KVA to 50 KVA in all standard primary voltage ratings up to 2400 volts. Write for Bulletin.

ACME ELECTRIC CORP.

364 Water St. Cuba, New York

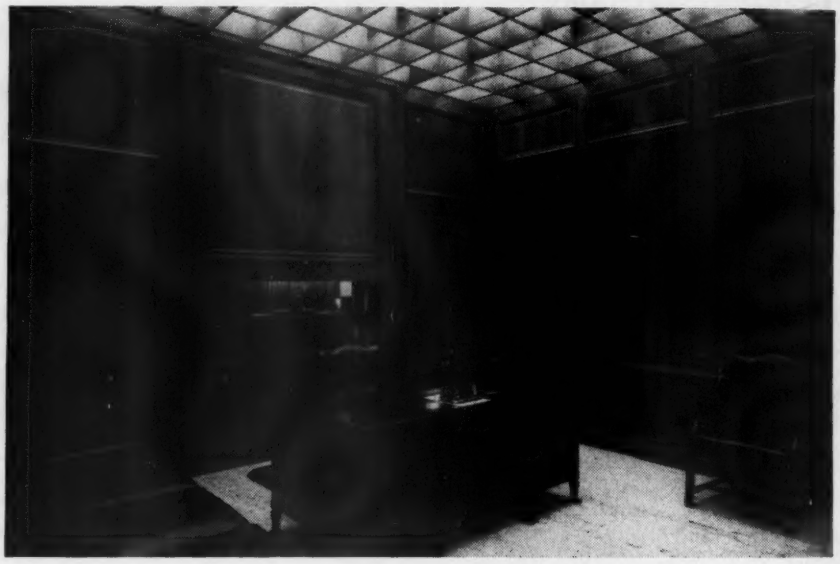
Manufacturers of Transformers for Fluorescent lighting, radio and television, neon signs, electronic devices and rectifiers.

Acme Electric TRANSFORMERS

eleven 72-inch T-6 Slimline lamps, spaced on two foot centers, and 2½ inches below the main ceiling, or 11½ inches above the bottom of the louvers.

The lighting intensity is 55 footcandles maintained in service. Louver brightness ranges from 40 to 60 footlamberts. Except for the slate blackboards, brightness ratios do not exceed three-to-one, which results in a high degree of eye comfort throughout the classroom. The lamps in each bay section are controlled by a separate switch, which permits any quarter of the room to be lighted independently.

The louvers and metal work, including wiring channels, were made by the Federal Electric Company, Chicago. Slimline lamps were furnished by the General Electric Company.



President's office with deep, western cedar, louverall ceiling behind which 72 100-watt fluorescent tubes provide 140-footcandle illumination. Switch control also provides 85 and 40-footcandle levels. Wall panels are walnut.

Planned Lighting In A Contractor's Office

That a man must have the latest and best in tools to work efficiently is the philosophy upon which C. A. Harlan, president of Harlan Electric Company, Detroit, has built a highly successful electrical engineering and construction business. It is a theory that Harlan applies in the field, in the shop and in his offices. Whether such a tool be in a man's hands or incorporated in the physical makeup of his surroundings, the result is the same.

Good lighting is one of the best tools a man can have. Hence the emphasis on planned lighting in the new headquarters of the Harlan Electric Company on the John C. Lodge Expressway at Milwaukee Ave., Detroit. Here,

Reception lobby has three-level illumination (12, 30 and 50 ft.c.) from flush fluorescent units. Paneling is wormy chestnut. Murals on stairway walls at left (not shown) are illuminated by troffer valance.

Why I always use CERTIFIED BALLASTS in fixtures I make!

● As a fixture manufacturer, I must have assurance that my complete fixture will be dependable and trouble-free in operation. I can't afford to offer a fixture that doesn't protect wholesalers and contractors and assure greatest satisfaction to the user.

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Certified Ballasts assure—

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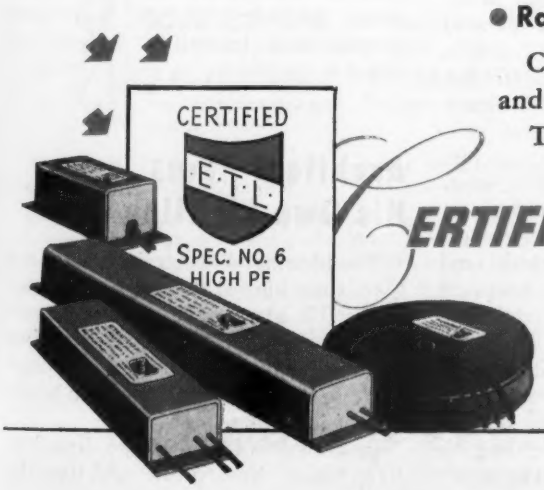

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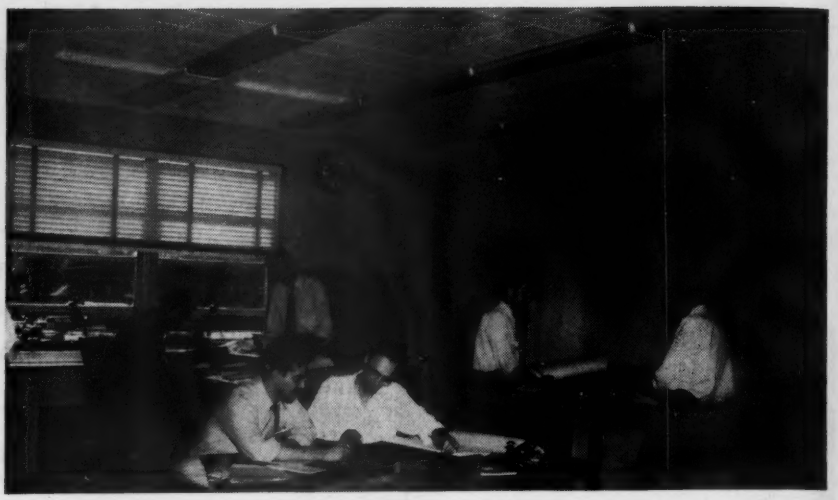


Engineering department, where design and estimating work is done, has five continuous rows of fluorescent units that provide 75 footcandles at desk level.

Continuous row troffers with projecting curved glass enclosures typify lighting in general office areas; provide ceiling illumination as well as direct lighting. This treasurer's office has 60-footcandle intensity.

modern functional illumination is skillfully blended into the architectural attractiveness of the office areas. Not only do the employees benefit, but customers can see a practical demonstration of the advantages offered by a carefully engineered lighting system.

Highest intensity in the 2,500 sq. ft. office area (10,000 sq. ft.-total area) is in the president's walnut paneled private office. Here a mere flip of a switch produces 140, 85 and 40-footcandle levels. Evenly diffused illumination is provided by a louverall ceiling 11 feet above the floor. Louvers are constructed of 1-in. by 13-in. western cedar lumber in an eggcrate pattern with 13-in. by 13-in. openings. Two feet above the louvers and mounted direct to the ceiling are 36 two-lamp (2 100-watt tubes), low-brightness (40-watt ballasts) industrial type fluorescent fixtures with aluminum reflectors. Units are installed in rows side-by-side (13-in. centers) and end-to-end. Three-level lighting is provided by switches controlling every third row (40 f.c); every second row (85 f.c.) and all units (140 f.c.).

The entrance stairway and reception lobby, paneled in wormy chestnut, features a huge two-story mural depicting the development of electricity; has three-level general illumination of 12, 30, and 50 footcandles provided by flush fluorescent fixtures on 4-foot centers in the 10-foot acoustic tile ceiling. Each unit contains three 20-watt, 3500° white tubes covered by a diffusing glass panel. Murals on the two stairway walls are illuminated by a continuous troffer valance with fluorescent tubes shielded by western cedar louvers.

Lighting in other areas, including the general offices, bookkeeping and engineering departments, consists of continuous rows (on 4-foot centers) of fluorescent troffers with protruding curved glass enclosures. Each fixture section contains two 40-watt, 3500° white instant-start fluorescent tubes. Lighting level at desk height in the bookkeeping department is 60 footcandles; in the engineering department, 75 footcandles.

The remaining shop and stockroom areas of the building are lighted by a system of industrial type fluorescent fixtures with intensities designed to suit the specific seeing tasks involved.

Architect Plans His Own Lighting

The housing shortage in New York City is not limited to homes and apartments. It also applies to office space for business and professional men. But such problems merely serve as a challenge to that good old American tradition of ingenuity.

In the case of Ken White, imaginative young New York architect-de-

LPI Fi-bord PUTS A STOP to louver maintenance problems

It's the Complete Answer

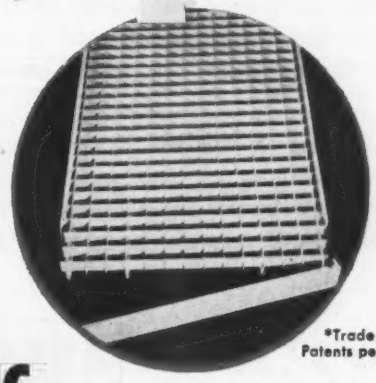
FI-BORD* (fiber-board) Louvers are exclusive with LPI—the *only* louvers offering *all* these amazing *new* features:

1. **NO MAINTENANCE** . . . You *don't clean* Fi-Bord; you *replace it*—at less cost than is required for cleaning ordinary louvers.
2. **FIVE COLORS** . . . Fi-Bord is available in white and in pastel shades of blue, pink, green, and yellow.
3. **EASY, SPEEDY INSTALLATION** . . . In less than two minutes per unit, Fi-Bord can provide a whole new color scheme.
4. **HIGH REFLECTION, LOW BRIGHTNESS** . . . Reflection factors up to 79%. Scientific louver design provides correct brightness control with light cut-off 38° in all directions.
5. **NEW REFLECTING SURFACES** . . . with each replacement. There's no light loss due to cleaning or scratched surfaces.

AND FI-BORD Louvers are fire resistant, light in weight, compact, easy to ship, and easy to handle.

FI-BORD Louvers are standard equipment on the LPI PANELUX*, the luminaire that gives "Panels of Light." *It's a complete* fixture and does not require a combination of fixture and false ceiling.

Write today for PANELUX Bulletin No. 420, or contact the LPI lighting representative nearest you. LPI fixtures are union-made (I. B. E. W.—A. F. of L.) and sold nationally through leading electrical wholesalers.



*Trade marks applied for
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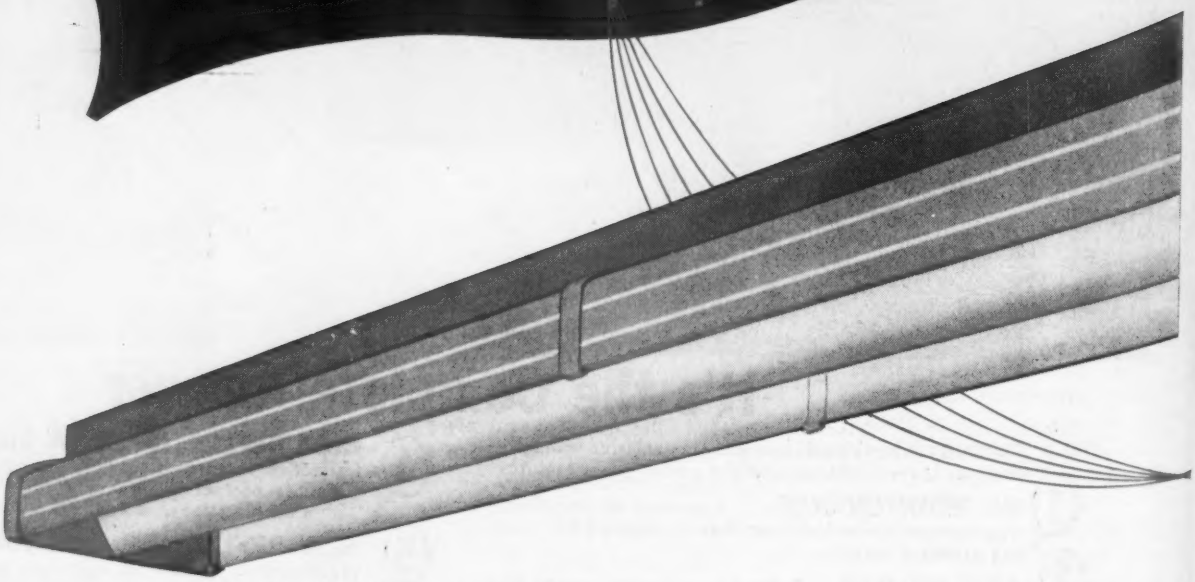
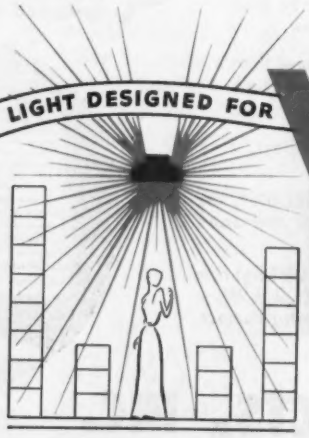
SPECIFICALLY DESIGNED FOR
RETAIL STORE ILLUMINATION



LIGHT DESIGNED FOR SELLING...



VERTICAL
ILLUMINATION

- **Using Two New T-12 -- 75 watt 96 inch Lamps.**
- **Instant Starting, More Lumens per foot of Lamp.**
- **Eight feet of Uninterrupted Light.**
- **Low Installation Cost.**
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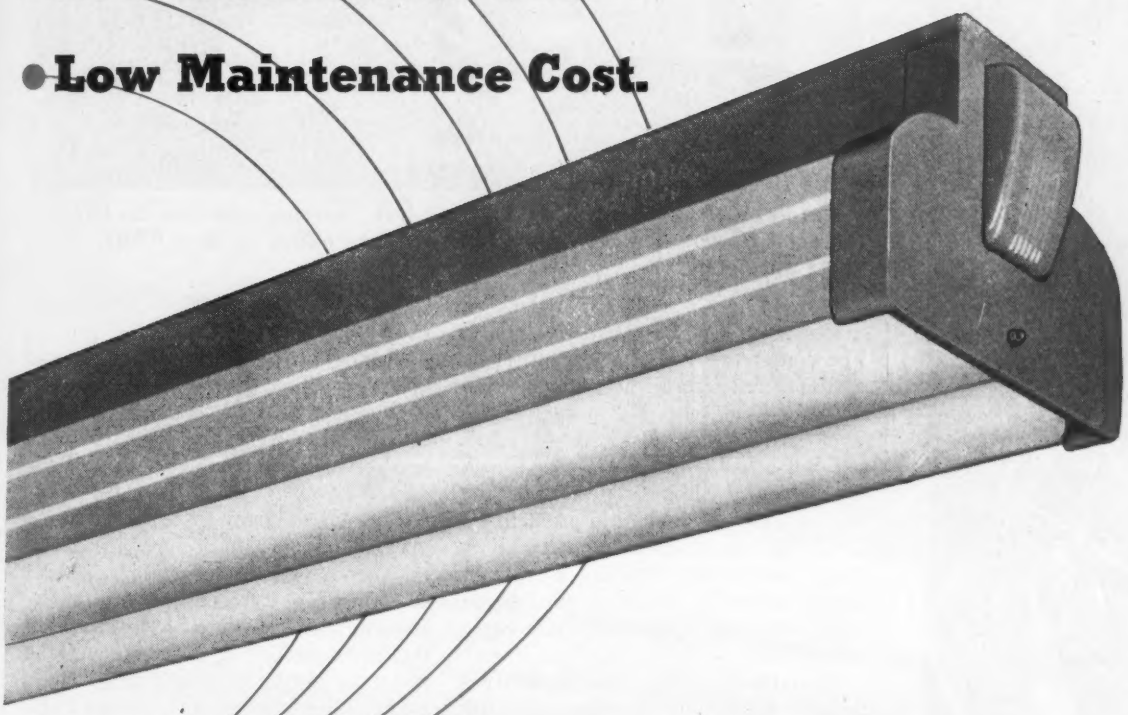

Here it is! . . . the new "Store-Liter" developed by Curtis to produce "Light for Selling". Now you can really tackle the biggest market in America today . . . Retail Store Lighting . . . The new Curtis "Store-Liter" has sparkle and efficiency . . . it produces Vertical Illumination (washes the walls with light) . . . and it is designed for low-cost installation and maintenance . . . it utilizes to full advantage the characteristics of the new T-12 . . . it features instant starting . . . more lumens per foot of lamp, and 96 inches of uninterrupted light per luminaire! Plastic side panels have longitudinal prisms which, through refraction, achieve a pleasing low-brightness effect and simultaneously provide illumination to vertical surfaces such as shelves, counters, mannequins, racks, etc.

The "Store-Liter" may be ceiling or pendant mounted, either as individual units or continuous lines. Maintenance and lamp renewal is possible from one ladder position. Send for full details, data sheets, and prices today . . . be prepared to get your share of this profitable market "Light for Selling".

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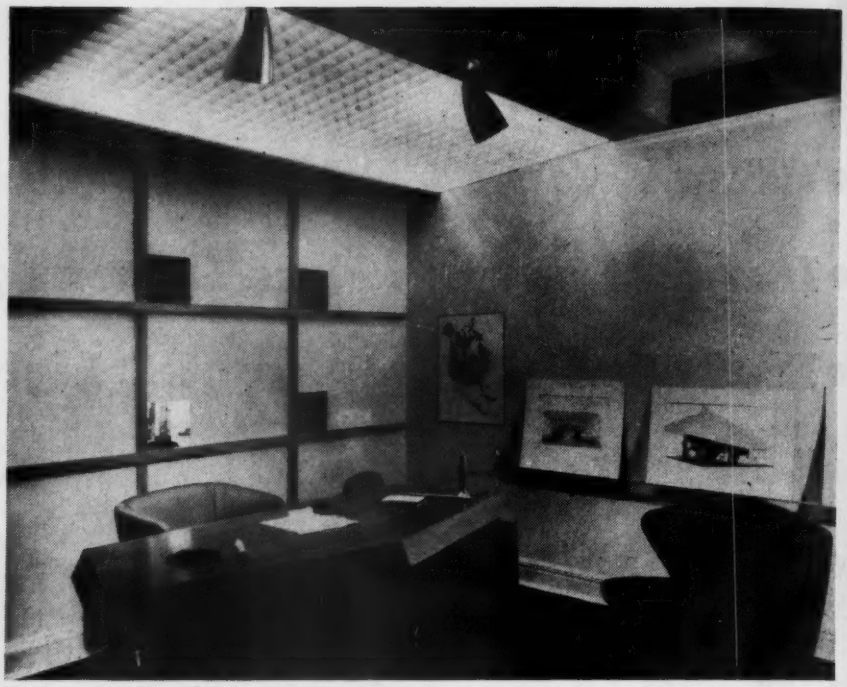


Light was used effectively to transform a drab, cheerless area into the bright, cheerful conference room shown above, in the offices of Ken White, New York City architect.

signer, he was frustrated by lack of space to hang an extra T-square. The conference room of his offices at 20 East 35th street was a small, drab and cheerless area. So, in view of the office space shortage, he did for himself what he would have done for a client. He used his ingenuity, with the aid of light, to solve this problem by relighting the conference room. It is now transformed into an airy, well lighted cheerful room, conducive to work and well suited for conferences with clients.

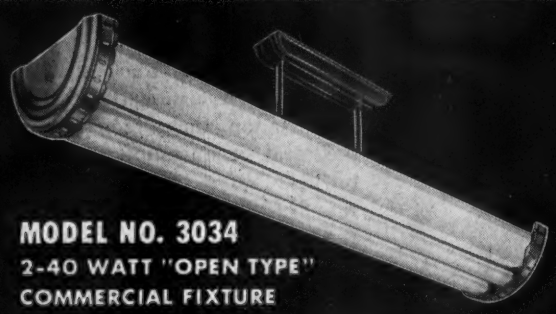
Over his conference and desk areas he put a standard General Lighting Company "ALLOUVER" ceiling unit to provide a high intensity of general diffuse lighting, efficient, soft and glareless. This louver section was installed flush with the bottom of a beam across the center of the room, and was used on the half of the room over his desk only. Fluorescent lamps on shallow wiring channel were installed above the louver section and the entire area above painted flat white. General Lighting Co. "Accentlites" with adjustable bases were also installed on the beam and ceiling, to supplement the general lighting and spot his display racks and work area on the desk.

Deep fluorescent troffers provide maintained intensity of 48 footcandles in office of new addition to Chicago plant of The Liquid Carbonic Corporation. Mounted flush in 10-foot ceiling on 10-ft centers, each troffer contains three 2-lamp 40-watt units (six 3500° white lamps) has 4-inch deep louvers on 12-inch centers. End-to-end space between units is three feet. Three-lamp units provide 68 foot-candles over drafting tables.

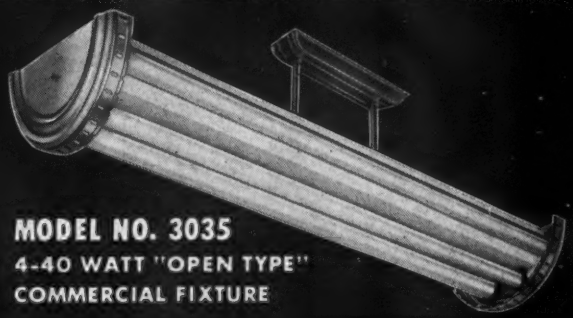
MITCHELL

"Special Value Group"

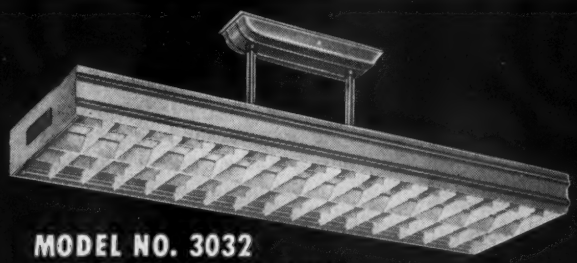
FLUORESCENT LIGHTING FIXTURES



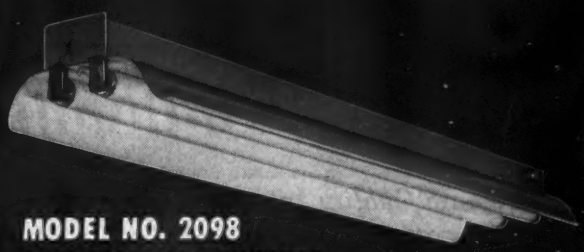
MODEL NO. 3034
2-40 WATT "OPEN TYPE"
COMMERCIAL FIXTURE



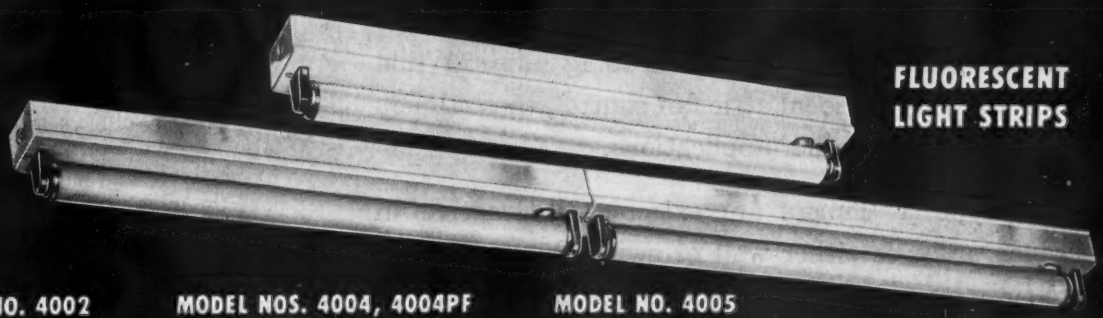
MODEL NO. 3035
4-40 WATT "OPEN TYPE"
COMMERCIAL FIXTURE



MODEL NO. 3032
4-40 WATT "WAFER THIN"
COMMERCIAL FIXTURE
With All-Steel Louver



MODEL NO. 2098
2-40 WATT ALL-PURPOSE
INDUSTRIAL UNIT



FLUORESCENT LIGHT STRIPS

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2-FOOT STRIP

MODEL NOS. 4004, 4004PF
4-FOOT STRIP

MODEL NO. 4005
8-FOOT STRIP

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For profitable volume sales and assured customer satisfaction, stock and sell the MITCHELL "Special Value Group." Here is a special selection of built-right, priced-right units—preferred everywhere for superior performance and economy. Each unit, like all MITCHELL products, is precision-made—constructed of 20 gauge steel, cleaned and "bonderized" before spraying and baking. Finishes are smooth, heat resistant, easily cleaned, highly durable. Only approved electrical components are used—and each fixture bears both Underwriters' and IBEW Labels—further assurance of universal acceptance, top workmanship and dependable quality.

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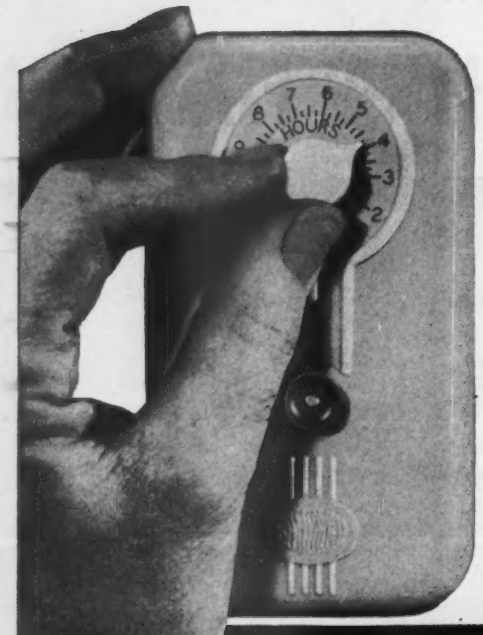

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Sangamo Type T Timers are extremely attractive in appearance, may be either wall or switch box mounted, and are fully guaranteed and priced *right!*

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Both types are available *now*. Bulletin 1070A gives full information—write for your copy.

SANGAMO ST495
ELECTRIC COMPANY
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50TH ANNIVERSARY SANGAMO 1899-1949

FIRE ALARM LAYOUT

[FROM PAGE 77]

pilot audible signals. These signals are located in elevator shafts, executive staff and engineer offices to alert and to call a local emergency fire fighting organization to subdue a fire in its early stage. Should a fire reach a point requiring the assistance of a Municipal or community fire fighting organization, the person in charge of the local organization inserts a plug or key into a jack located inside of the fire alarm station and then pulls the lever. This action causes the general alarm as well as the pilot bells to operate throughout the entire building. The trouble bell operates in the same manner as for the plain code fire alarm system.

A conduit riser diagram of a pre-signal fire alarm system is shown in Fig. 4. It shows the relative location of all general and pilot signals, stations and the control panel with the quantity and the size of the conductors and the size of the conduit. No pull boxes or terminal cabinets are shown for the same reasons outlined previously. The diagram shows two identical risers of a combination of station and general alarm bells, with two additional risers of pilot bells. The general alarm bells are divided into two circuits since not more than ten such signals may be connected to one circuit on 115 volts a-c. The stations are also connected in series through their respective contacts, that is, the general and the pilot circuits. It is to be noted that three wires are required in one station riser while four are required in the second station riser. Each of the pilot bell risers require two wires, and the bells in both risers are connected in series and terminate in a pair of terminals on the control panel separate and distinct from the general alarm bells.

Since as many as five and six wires are used in the main risers, the use of color-coded cables may prove to be advantageous especially on a large installation. One pair of color-coded wires may be used for the general alarm bell contacts, one pair for the pre-signal contacts in the stations. It is also preferable to use a pair of distinguishing colored wires to connect the pilot bell circuit, and the general bell circuits.

The pre-signal fire alarm system may also be arranged in other ways. For example a system consisting of risers of stations, one at each end of the building and one riser of general

alarm bells in the center of the building. In a building not exceeding ten floors all three lines of conduit terminate at the control panel. One riser of stations will require three wires while the second riser of stations will require four wires. The riser of general alarm bells will require two wires. The run of conduit to the pilot bells will require two wires. The conduit size in each case would be one-half inch. In addition it will be necessary to run a conduit from the control panel to the trouble bell. The wires for the pilot bells may be run in the same conduit as for the general alarm bells for a small distance and then extended to their respective locations.

Riser Arrangement

In a system consisting of stations and general alarm bells in one riser installed in a building ten stories in height it will only be necessary to run three wires for the stations and two wires for the general alarm bells. The size of conduit in this case would be three-quarter inch since five wires are required for the riser combining the stations and the bells. In the event that the pilot bells are located in the vicinity of the general alarm bells, part of the riser conduit system may be utilized and the two wires for the pilot bell circuit must be included. In the event that the pilot bells are to be located at some other points a separate run of conduit must be provided for these wires.

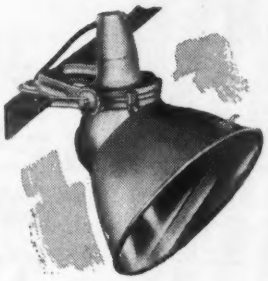
In systems using fire alarm stations requiring multiple conductors such as is shown in Figure 5, rearrangement of the conduit system risers may often be quite advantageous. At I, of this wiring diagram is shown a system having four bells and four stations connected to a control panel having a capacity of one bell circuit and one station circuit. In systems up to ten bells on a-c or 14 bells on d-c, with as many as 20 stations this system may be arranged as a single riser having the maximum number of audible signals and stations. Likewise, it may be arranged into the practical equivalent of two risers by running the wires up one side of the building, and then across in the ceiling of the top floor and then down to the second group of bells and stations.

At II, in Figure 5 is shown the standard method of arranging a two riser installation. It will be noted that it is necessary to install as many as six conductors in one riser and four in the second riser. The arrangement at I requires four wires throughout, thus effecting a saving in wiring.

GENERAL ELECTRIC

Floodlights

available from stock



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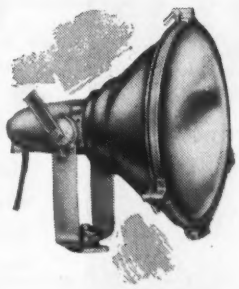

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Types L-82 and L-83—500 and 1000 watts. Portable as well as standard base. Alzak*-treated aluminum with hinged door. Narrow medium or wide beam. Also heavy-duty 200/250 watt cast-aluminum floodlight.

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Also new outdoor lamp holder with floodlight base for 150-watt Par 38 projector-spot or -flood lamps—only $2.95 without lamp.

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For more information, phone your nearest G-E agent or write Apparatus Department, General Electric Company, Schenectady 5, N. Y.

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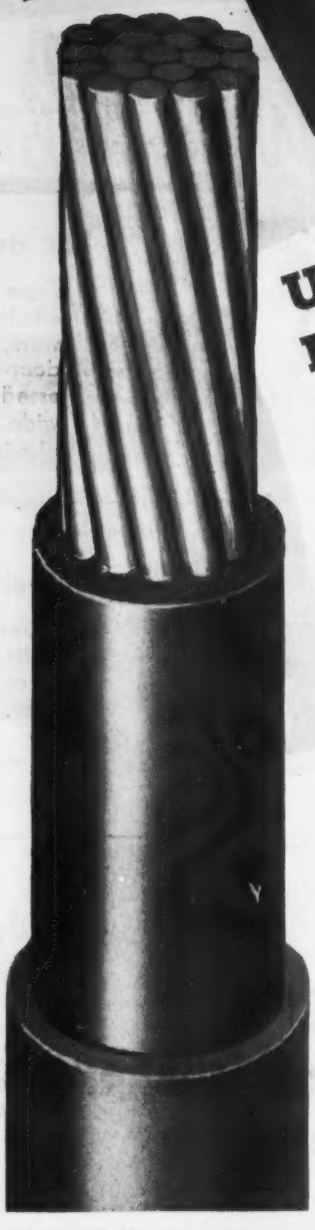

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NEW LITERATURE

Latest catalogs and bulletins of manufacturers are available to you without cost through this Electrical Construction and Maintenance Reader Service

(1) ILLUMINATION LEVELS INDICATOR —Calculux illumination levels indicator with instruction booklet and carrying envelope, providing scientific basis for determining required foot-candles for various seeing tasks. Holophane Co., Inc.

(2) CAPACITOR-START MOTORS—Bulletin X6157 includes full line of capacitor start motors with motors, tables and performance characteristics. Emerson Electric Manufacturing Co.

(3) TURN RATIO TESTING—Bulletin 55 discusses portable direct-reading instrument for measuring turn ratio of power and distribution transformers. James G. Biddle Co.

(4) CONTROL DEVICES — Catalogue, containing definitions, service classifications, ratings and performance tests, characteristics, allowable current-carrying capacities and other important data pertaining to control devices. Ward Leonard Electric Co.

(5) FUSES—Folder discusses series of fuses for current limiting between and 30 amps., time-delay, special long-time-delay for motors and penny-proof unit. Chase-Shawmut Co.

(6) MOTOR STARTERS—Short circuit protection for high voltage motor circuits is treated in Vol. 1, No. 23 of accelerator bulletin. Electrical Controller and Mfg. Co.

(7) BALLASTS—Wide line of fluorescent ballasts presented in file folder. Foil Co. of America, Inc.

(8) PRECISION MOTORS—Booklet of 8 pages presents selection data on a-c integral horsepower units built in conformity with new NEMA ratings and mounting dimensions. Reliance Electric and Engineering Co.

(9) TRANSFORMERS—Catalog includes chokes and transformers for audio, television, power and miscellaneous types. Crest Transformer Corp.

(10) LIGHTING REFERENCE — File LF2 presents line of incandescent and fluorescent fixtures for general and decent commercial illumination. Solar Light Mfg. Co.

(11) COMPRESSOR — Portable, ball bearing, heavy duty 2.5 cfm. air compressor is discussed in file sheet. The DeVilbiss Co.

(12) STUD WELDING—Stud specifications and price list is illustrated with text and pictures discussing standard and special studs. Nelson Welding Co.

(13) STARTERS — Across-the-line a-c motor starters for all types of motor drives are discussed and illustrated in 12-page bulletin 14B7132. Allis-Chalmers.

(14) INDUSTRIAL FLUORESCENT—File sheet contains views and brief description with weights and prices on open and closed end, louvered and plain units. Monogram Industrial Fluorescent Lighting.

(15) CRANES AND MONORAILS—Top running, underhung, double girder cranes; motorized and hand operated, with present equipment and monorails, are illustrated in 12-page 2-color bulletin. Abell-Howe Co.

(16) POWER TRANSFORMERS—Standard parts power transformer is analysed as to value and potential savings in 4-page pamphlet. Pennsylvania Transformer Co.

(17) STORE LIGHTING—Folder of outstanding lighting jobs in modern stores

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includes discussion on equipment available for this type of installation. Pittsburgh Reflector Co.

(18) CONNECTORS—Pictorial index of electric connectors facilitates reference to general information, capacities, dimensions and applications for wide variety of electric connectors. Bulletin GEC 400. General Electric Co.

(19) SOLDERING MANUAL—Technical manual of 28 pages, titled "Solder and Soldering Technique", includes complete analysis of properties and application of soft solder alloys and soldering fluxes. Kester Solder Co.

(20) SLIMLINES—Industrial fluorescent fixtures for individual and continuous installations, designed for two 96-inch T8 slimline lamps are discussed and priced in Bulletin 81. Wheeler Reflector Co.

(21) ELECTRIC HOISTS—Line of electric hoists from ½ to 10-ton capacities are pictured and discussed with drawings and specifications in 6-page folder DH65. Wright Hoist Division, American Chain and Cable Co.

(22) REFERENCE BULLETIN—Switchgear and switchbreakers, meter enclosures and cabinets and connection blocks are discussed in folder titled, "More Power to You". Code Electric Products Corp.

(23) INDUSTRIAL DEVICES—Glowing switchplates, mini-volt voltmeter, hi-volt voltage testor, pilot light, test light and steel straps are promoted in file sheet. Industrial Devices, Inc.

(24) FLUORESCENT EQUIPMENT — Commercial, residential and industrial lighting fixtures for standard and slimline lamps, are presented in catalogue. Work-O-Lite Co.

(25) ELECTRIC PLANTS—Model guide to help select electric plant is 20-page bulletin. D. W. Onan and Sons, Inc.

(26) MAGNETIC CONTROLS—Catalog includes information on automatic transfer switches, remote control units, contactors, relays and specialized controls. Automatic Switch Co.

(27) BRIGHTNESS CONTROL—Bulletin AD5428 discusses longitudinal shields for controling brightness ratios of fluorescent fixtures. Benjamin Electric Mfg. Co.

(28) VARNISHES—Full line of insulating varnishes is discussed in file folder having specifications, properties and recommended uses in tabular form for easy reference. George C. Borthig Co., Inc.

(29) BULLETINS—Four useful bulletins for loose leaf mounting, Numbers 201, 202, 203 and 302, give complete technical information on enclosed cutouts and panelboards, load centers and service equipment, circuit breakers and dust tight light and power control centers. Frank Adam Electric Co.

(30) SILICONE RUBBER — Illustrated 24-page bulletin CDP584 describes silicone rubber with relation to heat resistance; mechanical, electrical and chemical properties; performance and recommendations for use. G.E. Co.

(31) LIGHTING CATALOG — Pocket sized catalog on fluorescent and incandescent lighting equipment. Edwin F. Guth Co.

(32) PRESSURE CONNECTORS — Line of "Sta-kon" connectors for many applications, with hand tools and power tools, are pictured, defined and priced in Resale Price Sheet 2E. Thomas and Betts Co.

(33) LOADCENTERS — Quicklag loadcenters designed on thermal-magnetic principle, are presented in booklet B3881. Westinghouse Electric Corp.

(34) A-C CONTACTORS — Multi-pole magnetic type a-c contactors are discussed, pictured and dimensioned in file sheet 4454-4455. Ward Leonard Electric Co.

(35) TIME CONTROLS — Synchronous motor driven time controls, such as instantaneous and automatic reset, and time delay timers, meters and signaling timers are in bulletin sheets 58, 68, 78, 88 and 98. Industrial Timer Corp.

(36) BATTERY HANDBOOK — Pocket sized 40-page handbook contains instructions and engineering data on the care of motive-power batteries. Gould Storage Battery Corp.

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Where do we go from here?

NOW as never before, America stands at a cross-roads. One road is the way of easy promises by which we hope to arrive in the Never-never land of abundance for all and hardship for none.

The other way looks very much like the road we have traveled--the way that built America into the richest, strongest, most envied nation of all time. It is the road built by enterprise and resourcefulness and hard work--and thrift.

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In order to be sure all "U. S." electrical products deliver the utmost performance, there is the close-working team of the U. S. Wholesaler and the U. S. Rubber Salesman. This team is always on the job . . . working out more economical, more practical methods . . . ways to make sure "U. S." products yield the greatest value to purchasers.

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Today, as in the past, "U. S." is still a pioneer in the electrical industry . . . still going forward in its search for scientific discoveries . . . pledging itself to continue the research, the development and the efficiency needed to manufacture new and still better products.

UNITED STATES RUBBER COMPANY • ELECTRICAL WIRE & CABLE DEPARTMENT

1230 Avenue of the Americas • Rockefeller Center, New York 20, N. Y.

Answered by
F. N. M. SQUIRES
Chief Inspector
New York Board of Fire Underwriters
New York, N. Y.
and
GLENN ROWELL
Electrical Engineer
Fire Underwriters Inspection Bureau
Minneapolis, Minn.

Questions on the Code

Position of Outlet Box

Q. *Is it permissible to put a 3¼ in. or 4 in. octagon box below the ceiling for a light outlet?*

The question has arisen where a farmhouse was wired where no bars were available and the cable was put in the attic. The wires were pulled through the wood ceiling and into the top of the box and the box was mounted on the wood ceiling from underneath with wood screws.

According to our interpretation Section 3715 "Position in Wall" the last sentence would make this approved. Is this true?—D.E.C."

A. Yes. Outlet boxes may be mounted directly on the surface of a ceiling or wall. When a box is set into the wall or ceiling the front edge shall not be set back of the surface more than one-half inch for non-combustible wall or ceiling. On a wall or ceiling of combustible material, the box must be flush with the surface or project out from it.—F.N.M.S.

REA Wiring

Q. *On the REA project here we are required to take the pump circuit off the service between the meter and the main line switch and run it underground directly to the pump. Is this not prohibited by the Code?*
—J.H.D.

A. No, this is not prohibited by the Code even though the meter loop and switch are considered as the main service and not as a meter loop. Section 2321-a, while never intended for application to farm property, may be used to authorize such practice. Farm properties are usually well beyond regular water supply systems suitable for fire protection, so the water supply on a farm is of great importance in combatting fire. If the pump circuit were connected on the load side of the service equipment, a fault in the building on fire is likely to open the over-current protective devices in the service equipment or some unthinking individual might pull the main line switch. If the circuit is tapped in between the meter and the switch it will remain energized. It, therefore, would be an excellent idea I think for every REA project to make a similar ruling. Section 2321-a simply states that if a separate service is required for fire pumps, a second service drop may be run to the property. The requirement for use of an underground circuit to the pump is also very sound as it cannot be affected by fire in any of the buildings as an overhead circuit might be—G.R.

Filling Station Wiring

Q. *I have just turned down a filling station wiring job because I cannot wire it as the Code requires due to the construction of the gasoline pumps they want to use. I was much surprised to find a U. L. label on the pumps when they were equipped with ordinary lamp sockets and bulbs which are only some four feet above their base. Has there been some change made in the Code to permit the use of these low pumps so that it is no longer necessary to place a sealing fitting between them and the home run leading back to the station?—B.B.*

A. No, the Code has not been changed. Section 5142 states that all wiring and equipment within 5 feet of the grade shall conform to the provisions of Class 1 Division 2 of Article 500 of this Code. Then under Section 5019 you will note that fixed lighting in Class 1 Division 2 locations need not be explosion-proof if protected from mechanical injury by suitable guards or by location. Division 2 in my personal opinion is the most inconsistent provision ever included in a national code, as any place is either likely to contain a hazardous atmosphere or it is safe, there is no halfway measure. Even in gasoline manufacturing where the old type open tanks are used the atmosphere is explosive for a very small percentage of the time. However, this provision is in the Code, hence the ordinary lamps in the dispensing pumps within five feet of grade.

Section 5142 also states that all conduits shall be sealed as they enter dispensing pumps or other equipment on the island. Some of the new pumps do not provide sufficient space below the explosion-proof junction box contained in their base to mount an approved sealing fitting. Therefore it becomes necessary to design the island so that the required sealing of the conduits can be accomplished elsewhere. This can be done best by obtaining an especially constructed explosion-proof box designed to fit into the side of a pump island which contains sealing provisions. In some cases cavities have been placed in the islands below the pumps to provide the necessary space, but this may prove dangerous as it provides a low point for the accumulation of gasoline vapors.—G.R.

Thermostat Wire

Q. *We are planning a "Packaged installation" to be used throughout this area for sectional heat control, say in garages. In each area we plan to use a thermostat and an R 132A M-H relay. I say we can pull the common thermostat wire, which is armored, three wire No. 18, in the same conduit as the relay feed. Am I right? Does not the fact that the low voltage cable is armored nullify the ruling on low voltage cables occupying the same conduit as power and light wires?*—A.S.

A. If the "common thermostat wire, which is armored, three wire No. 18" is not made up of rubber or thermoplastic or other insulation having a voltage rating of at least 300 volts, it cannot be run in the same conduit with the relay feeds. The armor makes no difference.

We suspect that the thermostat wire referred to is only cotton covered wire, similar to the old fashioned annunciator wire, with a so called "armor" over it. This cannot be run in the same raceway with light and power wires.—F.N.M.S.

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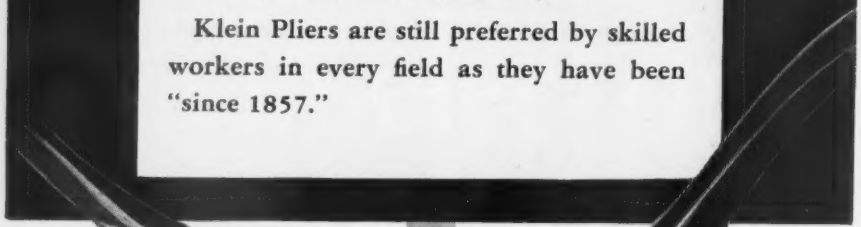
• Ever since the first communication and power lines were strung, Klein Pliers have been the favorite tools of electrical workers.

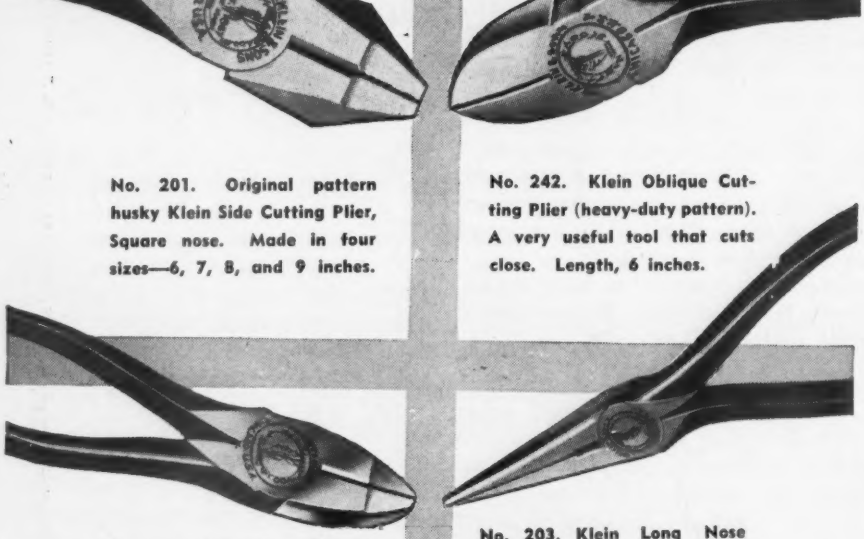
Today, Klein Pliers are made with the same exacting care that has won these tools their reputation for high quality.

Klein Pliers are still preferred by skilled workers in every field as they have been "since 1857."



No. 201. Original pattern husky Klein Side Cutting Plier, Square nose. Made in four sizes—6, 7, 8, and 9 inches.

No. 242. Klein Oblique Cutting Plier (heavy-duty pattern). A very useful tool that cuts close. Length, 6 inches.



No. 201 NE. The famous "streamlined" Klein Side Cutting Plier. Made in four sizes —6, 7, 8, and 9 inches.

No. 203. Klein Long Nose Plier. Long reach of jaws permits getting into difficult places. Made in 6 and 7-inch sizes.

The Klein Pocket Tool Guide, showing the Klein line and containing useful tool information, will be mailed on request.

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Relay Switching

Q. *I have become interested in the new low voltage switching controls for lighting as advertised by Square D and the G E companies. Where in the Code will I find permission to utilize the type of wire for the momentary contact switches the advertisements claim may be used—S.M.*

A. These low voltage remote control devices are operated by energy supplied through current limiting transformers which have maximum outputs on their secondaries of less than 3 amperes at less than 30 volts. In fact I believe the three companies now producing these devices limit the current on the low voltage circuits to approximately 24 volts at 1 ampere.

If you will refer to Section 7281 you will find that a circuit operating under such limitation is known as a Class 2 remote-control circuit and the Code does not contain any requirements for type of insulation which must be used for such circuits. Therefore thermostat or bell wire fastened with insulated staples may be used as specified in the advertisements for these control devices.—G.R.

Switches and Ratings

Q. *In the "Questions on the Code" Section—December, 1948, you have a question on Motor Installation. I have one similar. It has been our policy, based on past experience, to load our safety switches to only 60 or 70 percent of capacity.*

However, I have been instructed to install 25 hp. motors with size 2 magnetic starters through 60 amp. safety switches with 40 amp. fusetrons, connected directly to a 375 amp. copper bus protected by a 400 amp. air circuit breaker, 440 volt., 3 phase., 60 cycle.

I maintain that this switch should be horsepower rated as it serves as both the over current device and the disconnect switch.

I have been told that the switches are rated for increased horsepower when fusetrons are used, by a sticker placed inside of the cover but I cannot find this rating covered in the various catalogues.—C.J.G.

A. It is very good practice to load the present day switches to only 60 or 70 percent of their rated capacity. It is rather poor policy to load them over 80 percent of their rated capacity.

If the 60 amp. safety switches equipped with 40 amp. fusetrons have a sticker indicating that they have a

40 hp. 3 ph. 440 volt rating, it would be acceptable to connect them to a 375 amp. copper bus protected by a 400 amp. circuit breaker. The 40 ampere fusetrons would give them all the protection needed.—F.N.M.S.

Overcurrent Devices

Q. *We have constructed a small control panel for the operation of gasoline driven standby generating plants for use on farms or hatcheries or similar locations. The largest unit has an output of 15 kw. On this panel we have provided fuse clips and ordinary cartridge type fuses of the proper size. Recently a purchaser of one of these plants refused to accept delivery as he stated the local inspector refused to O.K. it unless the fuses were enclosed within a metal compartment. Does the Underwriters Code contain such a provision?—K.C.M.*

A. The National Electrical Code under Section 243 contains the ruling the inspector has referred to. This reads as follows: "Overcurrent devices shall be enclosed in cutout boxes or cabinets, unless a part of an especially approved assembly which affords equivalent protection, or unless mounted on switchboards, panelboards or controllers located in rooms or enclosures free from easily ignitible material and dampness." Therefore if your panel control board could be installed only in rooms or enclosures free of easily ignitible materials, it would comply with the Code, but as small standby units such as these are likely to be used in every conceivable type of building or room, the majority of which will either be combustible or contain combustible material, the inspector was no doubt correct in requesting the fuses to be enclosed within a metal box or cabinet.—G.R.

Horsepower Rated Switches

Q. *A 40 hp. motor-220 volt, is being installed for an air conditioning unit. The power panel is within the same small room and closely adjacent to said motor.*

All pull switches in the panel are marked in hp.-3 and 7½, respectively, except the one for the 40 hp. which is marked in amperes only. Will this pull switch be allowed as a disconnect if time delay fuses, as approved by the U.L.-Sec. 4346-1947, National Electrical Code, are used? Are there ex-

Operate TWO Mercury Lamps From ONE General Electric Tulamp Ballast

You're bound to save when you plan your mercury lighting installation the Tulamp way. Specify G-E Tulamp ballasts, and you automatically cut in half the number of ballasts usually required—and you get better all-around performance to boot!

Tulamp ballasts—each of which operates *two* mercury lamps—give you a flock of other advantages: power factor of 90 to 95 per cent, smaller wire sizes, better fuse protection, faster installation, lower ballast costs and virtually no stroboscopic effect.

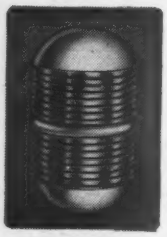
These compact, highly efficient units are designed for both the H-1 400-watt lamp and the H-5 250-watt lamp. Ballasts are also available in single-lamp units for operation of all standard mercury lamps. For details, contact your nearest G-E office today or write for bulletin GEA-5070. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

412-44

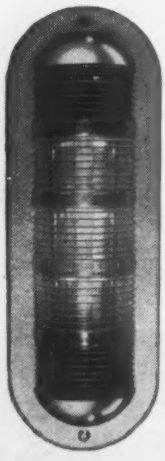
NEW LIGHTS by Cannon Electric

DNP-1



DNP-2

DNP-3



DPF-9

UTILITY PILOT LIGHTS

... ARE ALL-PURPOSE COLORED LIGHTS FOR SIGNALING, WARNING, DECORATION AND MODERATE ILLUMINATION, ETC.

... AVAILABLE IN 5 COLORS: CRYSTAL, RED, GREEN, BLUE AND AMBER, AND COMBINATIONS.

... TWO VOLTAGES: 12V, 15CP or 115V, 6W.

A SECOND cousin to the now well known *"Pathfinder Light,"* the Utility Pilot Lights utilize the same 180° unbreakable plastic (polystyrene) prism lens as used in the Pathfinder.

The DNP Light was first designed for the signal lights for Bullock's-Pasadena—one of the most modern, striking, up-to-date department stores in the country.

MOUNTING

DNP Lights are mounted on plaskon plates in antique ivory, or silver, bronze, copper or gold hammertone finish. Types DNP-1 and DNP-2 mount on two-gang plaster rings, DNP-3 on a four-gang plaster ring and must be mounted vertically.

SNAP-ON CONSTRUCTION

Unique for simple and easy lamp change or replacement is the Snap-on construction, requiring no tools.

Individual barriers are provided between color lens, although these may be omitted, if desired. Type DPF-9 uses a 9" 6W fluorescent lamp, without barriers.

Write for Bulletin No. UPL-1 for a color reproduction and additional data, and QL-1 for prices.

BROADCAST STATION LIGHT

This indicator Light Type Q-12 is equipped with 2 standard Cannon Electric Dome Lights mounted on a plate having an illuminated panel upon which may be lettered "ON THE AIR," "DO NOT ENTER," etc. Used inside auditoriums, control rooms, etc. Lights flash in whatever timing your present equipment provides. Write for Bulletin No. Q-1. Address Dept. No. D-231.

CANNON ELECTRIC

CANNON ELECTRIC

SINCE 1915

Development Company

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TORONTO 13, ONTARIO

WORLD EXPORT (excepting British Empire):
FRAZAR & HANSEN, 301 CLAY STREET
SAN FRANCISCO 11, CALIFORNIA

ceptions to Sec. 4402 which provides that such a switch be itself marked as Motor Rated? The ampere rated panel type pull Switch above mentioned is slow make and break.—M.W.T.

A. The switch marked 3 hp. is all right as the disconnect for a 3 hp. motor, as the 7½ hp. rated switch is good for a 7½ hp. motor, but a switch which is *not* marked with a 40 hp. rating is *not* acceptable for use as a disconnect for a 40 hp. motor whether or not time delay fuses are used.

If the switch is suitable for use as a 40 hp. disconnect when used with time delay fuses, the Laboratories will permit the manufacturer to place a sticker in the enclosure indicating this. The manufacturer must not do this unless so permitted by the Laboratories.—F.N.M.S.

Outlet Boxes

Q. *I was called back on a job on which I had used some plastic outlet boxes because several knockouts were missing and not having any plugs which would fit, I made up a double metal plate which I held in place with a stove bolt run through the knockout. The inspector turned that down too, saying that metal plugs could not be used on the outside of a plastic box. What does the Code have to say about plugging these boxes.—C.S.O.*

A. The N. E. Code accepts the use of a metal plug in a nonmetallic outlet box only when it is recessed at least one quarter of an inch from the outside surface. This requirement will be found under Section 3712 of the Code. No conductive metal of any kind with the exception of its means of support, is permitted within one fourth inch of the outside surface if it is exposed to the inside surface of the box.—G.R.

Studying raceway possibilities of Unistrut at recent Milwaukee EME Show are: A. W. Schwind, George Butler Co., Milwaukee; and John E. Wise (right), electrical engineer, Wisconsin Industrial Commission, Madison, Wisconsin.

HARVARD RELIGHTS BAKER LIBRARY

[FROM PAGE 82]

tion box. Steel conduits tie the junction boxes together along the roof steel and extend to the lighting cabinet. Number 14 AF 600 volt fixture wire was used in the greenfield.

The scheme for controlling the ceiling and cornice lighting was worked out as follows: Each of the library sections is provided with two lighting panels, one for the Slimline lamp fixtures and the other for the pendant luminaires and the cold cathode cornice lighting. Located adjacent to these two lighting panelboards is a contactor cabinet containing two contactors which are used for the control of each lighting panelboard. Mechanically held type of contactors were used in order to eliminate the hum from the relays. The contactors were controlled from momentary contact switches located at the main desk of the reading room. The ends of the feeder conduits leading into the contactor panels were made up of approximately three feet of flexible conduit where connecting directly to the cabinet. This was done to prevent the relay operation noise from "telegraphing" through the steel conduit, which if not taken care of in this manner would have caused annoying disturbances to the students. A completely new feeder system was installed making use of a four-conductor, three-phase, solid-neutral, 120/208 volt, 60 cycle wiring system.

The main reading room was completely renovated, a new acoustical treatment applied to the ceiling and the existing oak wood finish was stripped and finished in a lighter color. The ornamental plaster work and the walls were painted white. All of these changes in the interior finish of the room decreased the amount of light absorbed, thus increasing the utilization factor of the new lighting system.

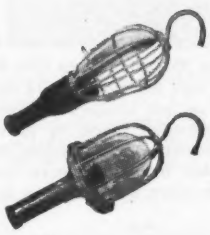
The Slimline fixtures and the ceiling louvers were manufactured by the Fullerton Manufacturing Corporation of South Norwalk, Connecticut. The electrical installation was made by the Hixon Electric Company, Electrical Engineers and Contractors of Boston, Massachusetts. The project was administered by the office of Irving B. Parkhurst, Director of the Department of Buildings and Grounds of Harvard University. Stanley B. Parker of Cambridge, Massachusetts was the consulting architect, and the electrical engineer was Thompson Engineering Company of Boston.

All Purpose Service Light
... with a hundred and one uses

The NEW McGill 505 All Purpose Service Light is equipped with concentrating lens to focus light where you need it most. Concentrating lens make light from 100 watt bulb 6½ times as bright at two feet . . . doubles the intensity at eight feet. Simultaneously, the adjustable rotary reflector spreads ample illumination. Equipped with handy wire bracket stand the 505 can be used on the floor and easily positioned through a full horizontal swivel and 270° vertical arc to focus light conveniently at any angle. With stand removed the 505 can be mounted on wall or ceiling. Ruggedly built of heavy zinc plated steel wire, electrically welded. Handle is polished hard wood. The 505 is equipped with LEVOLIER switch and 25' of oil and grease proof Vynl Thermoplastic cord and plug.

PORTABLE GUARDS FOR EVERY REQUIREMENT

Built of highest quality material and backed by 44 years of "know-how." Cages heavy steel wire plated for long life, exclusive No-Rol design. Handles of rubber or wood with internal construction that takes strain off of socket and cord connection, complete with rubber bushing for extra protection. Sockets and switches all meet or surpass Underwriters requirements.



No. 7000-SR—Most popular design all-purpose guard. Rubber handle. No-Rol cage.

No. 3006 Vaporproof — Watertight and moisture proof. Light weight. Heat resisting globe.

No. 8025-SR—Service Light — Wood handle, Thermoplastic cord and plug. No-Rol cage.

No. 151-CA Lamp Changer — Head with angle adjustment. New insulated interchangeable 5' section steel poles.

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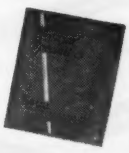

For Catalog No. 43 write to McGill Mfg. Co., Inc., 450 N. Campbell St., Valparaiso, Indiana.

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2 NEW AUSTIN STEEL CHANNEL BOX HANGERS!

Nail between joists - Eliminate Notching

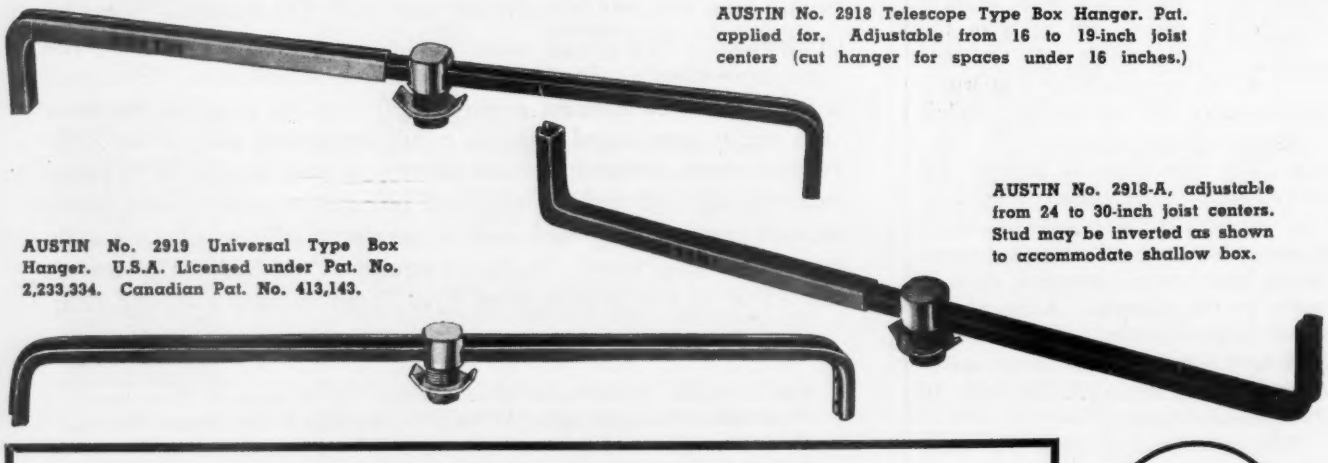
USE AS STRAIGHT, SHALLOW OFFSET OR DEEP OFFSET BOX HANGERS

One Instead of Three— Perfect Alignment—Stronger, Lighter, Easier to Handle!

Because these new AUSTIN Box Hangers are nailed between the joists at any desired height they can be used as Straight, Shallow Offset or Deep Offset Box Hangers.

No notching of joists is required as with the old conventional types to keep from bending, warping, or cracking surfacing material.

The steel channel (see cross-section illustration) provides greater strength and rigidity yet is much lighter in weight and therefore easier to handle.



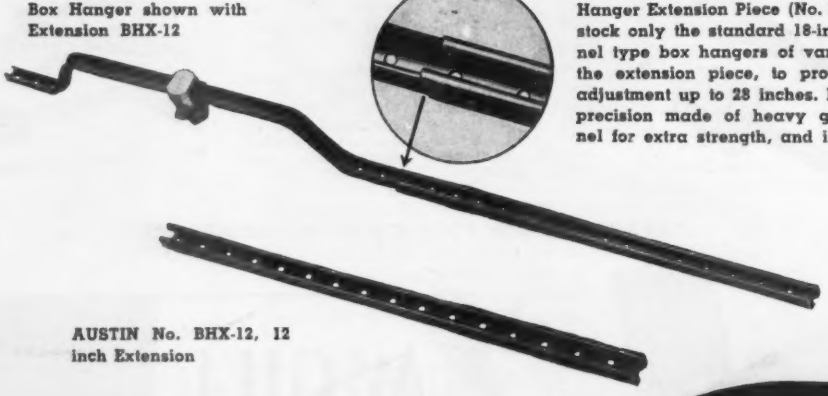
AUSTIN No. 2918 Telescope Type Box Hanger. Pat. applied for. Adjustable from 16 to 19-inch joist centers (cut hanger for spaces under 16 inches.)

AUSTIN No. 2919 Universal Type Box Hanger. U.S.A. Licensed under Pat. No. 2,233,334. Canadian Pat. No. 413,143.

AUSTIN No. 2918-A, adjustable from 24 to 30-inch joist centers. Stud may be inverted as shown to accommodate shallow box.

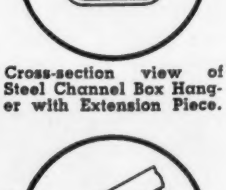
KEEP BOX HANGER INVENTORIES LOW WITH AUSTIN'S NEW SLEEVE EXTENSION PIECE!

AUSTIN No. 2905 Offset Box Hanger shown with Extension BHX-12



AUSTIN No. BHX-12, 12 inch Extension

With AUSTIN'S new 12-inch Sleeve Type Box Hanger Extension Piece (No. BHX-12) you need stock only the standard 18-inch AUSTIN channel type box hangers of various designs and the extension piece, to provide a maximum adjustment up to 28 inches. Extension piece is precision made of heavy gauge steel channel for extra strength, and is light in weight.



Cross-section view of Steel Channel Box Hanger with Extension Piece.

Sketch illustrating how Extension Piece slides over Box Hanger end.

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NORTHBROOK, ILLINOIS

In the News

Minnesota Convention Views New Frontiers

More than 400 electrical contractors from Minnesota and surrounding states participated in the annual electrical industry convention held at the Radisson Hotel, Minneapolis, February 27—March 2. Sponsored by 15 trade groups and coordinated through the North Central Electrical Industries, the four-day conference included numerous individual group sessions with all-industry meetings presenting subjects of interest to all segments of the electrical fraternity. A full program of industry leaders explored the frontiers that lie ahead of their respective fields; drew a record non-show attendance of better than 1,000.

At the opening luncheon, Fischer Black, editor, *Electrical World,* discussed the outlook for the utility industry. Electrical energy use increased 10 percent in 1948; is now running about 7 percent over that—a growth that will be maintained for some time to come. The utility industry, including federal government projects will spend about $3 billion a year for the next three years on power system additions; expects to reach a 15 percent reserve capacity in 1951, although a 10 percent reserve would suffice, Black revealed. While the average cost of supplying electric power to a customer will be $548 per kilowatt (1947-1949), compared to $358 for the 13 pre-war years, the average cost of electricity to the ultimate consumer has hardly changed, going from 1.77 cents per kw.-hr. in 1947 to 1.79 cents last year. Average residential customer cost has dropped from 3.09 cents per kw.-hr. in 1947 to 3.01 cents last year. Mr. Black urged the entire electrical industry—private utilities, co-ops, municipals, contractors, wholesalers, distributors, retailers and manufacturers to cooperate in the fulfillment of a broadened interdependence. Unless this is accomplished, we may find ourselves in the sad position of our neighbors across the sea, he concluded.

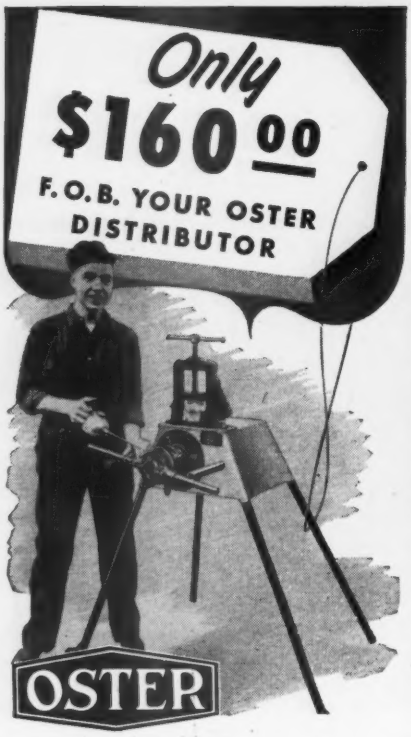
An afternoon session was devoted to the general subject of lighting with such authoritative speakers as Robert Wylie, Sylvania Electric Products, Inc.; C. M. Cutler, Head of Light-for-Selling Section, General Electric Lamp Dept., Nela Park; and Myrtle Fahsbender, Director of Home Lighting, Westinghouse Electric Corp., Bloomfield, N. J., headlining the program.

Fluorescent lighting equipment requires maintenance service of an experienced electrician rather than a general handy man, Mr. Wylie emphatically stated, while urging electrical contractors to enter this new field of endeavor. Fluorescent maintenance logically consists of electrical maintenance and cleaning service; can be adequately handled by a qualified licensed electrician with a sales and promotion minded trained helper; should be done on a cost-per-lamp-per-month contract basis (National average 20 cents per lamp per month). Once an account is sold a maintenance program, the contract often serves as a feeder to more lighting business, Wylie pointed out. Since 80 to 90 percent of maintenance cost involves man-hours (labor and sales) efficiently trained personnel is important. With almost negligible monetary investments, established contractors are already showing five-figure profits in the maintenance business, Wylie revealed.

Lighting is one of the best buys in sight; it plays an increasingly im-

Key men of the D. F. Kehne Electric Company, St. Paul, Minn., make a final check on an estimate and bid. The are: (L to R) Don Kehne, president; Harlan Erickson, office manager; Charles A. Peterson, chief engineer and estimator; and Edward LaPointe, superintendent of construction.

Low voltage remote control wiring demonstration at recent Milwaukee EME Show attracts: (L to R) J. M. Dryer, G. E. Supply Corp., Milwaukee; J. M. Driscoll, operating engineer, Oil Construction Co., Milwaukee; C. E. Hale, electrical maintenance dept., Kerney & Trecker Corp., Milwaukee; and D. S. Gordon, G.E. Supply Corp., Milwaukee.



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Standard range of this machine is ⅛" to 2" pipe. Equipped with a universal drive shaft (at extra cost) the No. 422 *safely* drives geared receding die-stocks up to 6" capacity, inclusive.

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Electrical maintenance engineers watch demonstration of a variable speed drive at the Holt Electric Co. Booth at Milwaukee EME Show. J. Beam, field engineer, U. S. Electric Motors, Inc., operates this Vari Drive unit.

portant part in the construction and merchandising field—particularly in retail establishments where 38 to 40 percent of purchases result from "impulse buying", asserted Mr. Cutler. The general trend to more store interior and show window illumination demands more creative thinking and planning on the part of the engineers for each specific job, he added. With the aid of colored slides of unusual installations and color comparison booths, he illustrated what can be done with planned lighting.

That residential lighting also must be carefully planned was effectively illustrated by Miss Fahsbender. Using a four-house project in Hartford, Connecticut, ranging from $12,000 to $25,000 in price, she revealed what can be done with lighting ranging from 0.6 percent of the cost of the thrift house to 3.2 percent of the cost of the deluxe unit.

Lighting and heating were major discussions at the rural electric equipment session. L. H. Hill, Twin City Milk Producers Association, revealed that dairy barn lighting has made farmers conscious of cleanliness and has been one of the major factors in changing a dairy area from a Grade B to a Grade A milk producing section. Installation of water heaters in the milk house, as well as good lighting, has been a great impetus in reduction of bacteria count. A few farmers have even tapped their milk house hot water heaters to supply heat to the milk house, he revealed. A radiator with a fan provides a unit heater installation.

Marvin Nabben, Northern States Power Company, revealed that last winter several farms converted their milk coolers to a type of heat pump that has proven economical and dependable. One farmer producing 350 ten-gallon cans of milk per month, used the converted unit and received the equivalent of 700 kw.-hrs. of heating per year for his milkhouse. Cost is about one-third that of space heating —including equipment, installation and energy charges.

Biggest problem facing the manufacturers is their lack of a definite plan to sell the farmer electrical equipment. L. R. Emmert, Manager, Rural Electrification Department, Westinghouse Electric Corp., told the audience. We have been confusing the farmer by having too many motors, too many methods of doing things, too much emphasis on horsepower, amperes and kilowatts. Emmert would like to see a halt to introduction of new variations of present equipment and ratings; a simplification of equipment selection to narrow the field of decision; greater accessibility of home appliances to farm families.

At the all-industry session on merchandising, Albert McNamee, McCall's Magazine, presented first-hand information on the appliance market situation. It is definitely a buyer's market and effective selling is needed —a healthy sign, he revealed. Among the causes of the present situation he listed: too many franchises; back-door selling by distributors, manufacturers surprise launching of new models without adequate protection to dealers; "floor sample" price reductions and other price manipulations. Although there is a definite improvement in quality of appliances and parts, there is still room for much improvement, McNamee feels. Industry problems should be solved within the structure of the industry and not by

"protective laws" he concluded.

While discussing adequate wiring, Carl Christine, Manager, St. Louis Electrical Board of Trade, urged those present not to confuse industry standards with municipal codes. Such codes are safety standards and are not concerned with adequacy and efficiency, he added. Mr. Christine presented the dramatic "St. Louis Story" of adequate wiring, using effective demonstrations to show energy losses due to long conductor runs and voltage drop.

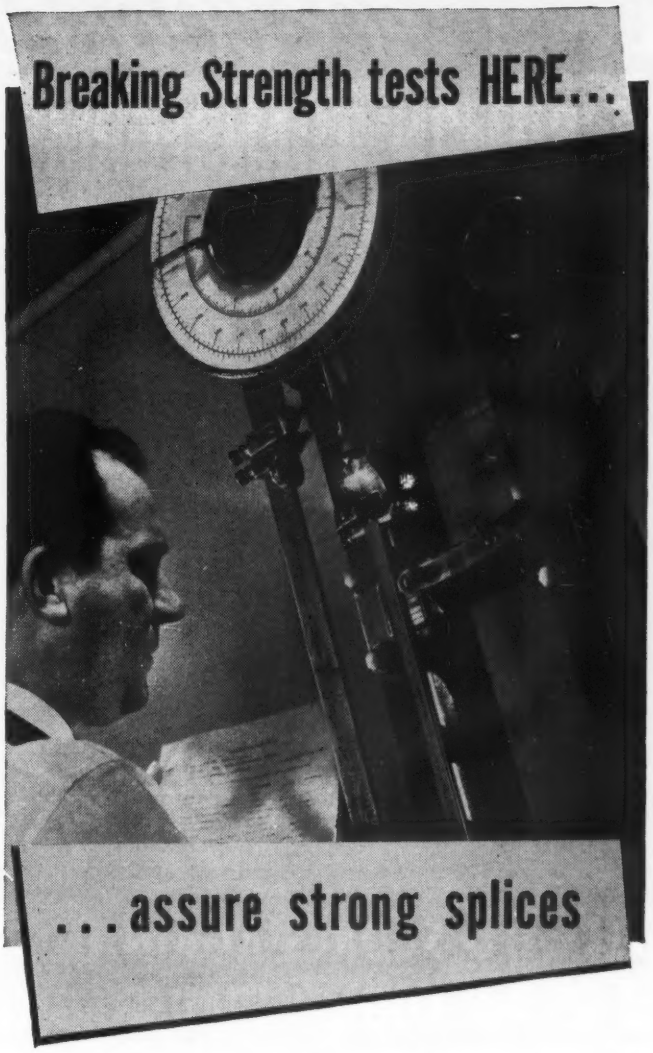
Look for increased stimulus to sell television receivers. According to George S. Peterson, G. E. Company, Chicago, the television industry will build two million receivers in 1949—a $656 million market.

An insight into the two billion dollar electrical construction market facing electrical contractors in 1949 was presented by W. T. Stuart, editor, *Electrical Construction and Maintenance,* at the 17th Annual Meeting of the Midwest Electrical Council. The impact of this market on local activities must be studied, and plans and policies formulated accordingly, he cautioned. Markets must be created and sold, he added, noting that lighting presents one of the greatest markets of all times to the electrical contractor—absorbing a greater proportion of pipe, wire and labor. At least 50 percent of electrical construction in commercial and industrial work is lighting compared to about 25 percent some 10 years ago, he revealed. As electrical contractors, we must accept a much greater share in the sales of lighting through creative aggressive salesmanship.

Mr. Stuart warned that present standards of adequacy are far too low to devote brain power to the narrow channel of cost reduction. Too frequently the potential for more work is overlooked in an effort to cut a bit off a job. With every industry fighting for the building dollar, competition between the electrical industry and other industries is far more important than competition within our industry itself, he stated. On the horizon of the future, Mr. Stuart sees electric panel heating, synchromechanisms, and automation in control.

At the 21st annual meeting of the Minnesota Electrical Association, officers reported progress during the past year; announced a new advertising service to the record attendance. William A. Ritt, Secretary of the group, reviewed such expanding markets as rewiring, rehabilitation and new construction; warned that now is the time for united action and not petty squabbling among the industry members.

On the Technical Program of this group were H. H. Watson, G. E. Co.;



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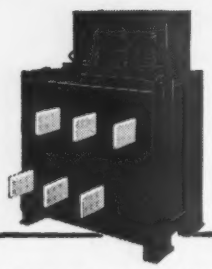

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1 to 2,000 KVA up to 15,000 Volts to meet Individual Requirements

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From a Pioneer in the field comes a new distribution transformer—AIR COOLED, DRY TYPE. No hazardous oil or toxic liquids to fuss or bother with. The use of superior class B and C heatproof insulation such as fibre-glass, mica, porcelain, new Johns-Manville Quinterra and similar inorganic material results in a transformer that can withstand the overloads that normally would damage an ordinary class A (cotton and paper) insulated oil filled unit. The entire transformer element is seal protected against oil, acids, moisture, etc., and is housed in a sturdy, scientifically ventilated, weatherproof case which conforms with all applicable EEI-NEMA construction standards. This extremely versatile transformer can be used outdoors, pole or platform mounted or indoors at the load center, mounted wherever convenient with no expensive fireproof vault required.

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Representatives in Principal Cities

MARCUS TRANSFORMERS CONFORM TO THE STANDARDS OF N.E.M.A. AND A.I.E.E.

Electrician B. Berendsen (right), Uhlein Electric Co., Milwaukee, learns the fine points of timing relays from J. E. Shackton, sales engineer, Allen-Bradley Co., at recent Milwaukee EME Show.

and Sam J. Rosch, Anaconda Wire & Cable Company. Mr. Watson demonstrated with the use of slides and models, the operating characteristics and installation techniques of the new low-voltage remote switch control system for lighting installations.

Mr. Rosch warned that we are fast becoming a have-not nation in copper and other metals and hence must find additional means of using more power with less materials. His answer is the application of higher voltages with conductors insulated with Butyl rubber hi-voltage insulations. Rosch expects the new Neoprene barn wire to become a universal conductor for rural wiring; announced that this wire is now receiving Underwriters Laboratories approval; predicted that Neoprene insulation will fast replace lead and metallic shielding systems up to 2,000 or even 5,000 volts; suggested the use of Duraprene insulated conductors (good up to 400 degrees F.) for recessed and semi-flush fixture installations.

One evening session was devoted to a review of NEC and Minnesota Farmstead wiring standards with floor discussions.

At the regular business sessions of the above groups, the following officers were elected for the ensuing year:

Minnesota Electrical Association, President, John H. Engel, Foster Electric Co., Rochester, Minn.; Vice Pres., C. D. Burton, Burton's Inc., Brainerd, Minn., Secy.-Treas., Wm. A. Ritt, Ritt Electric Center, St. Peter; Manager, A. Earl Anderson; Director (1 yr. to succeed C. D. Burton for unexpired term), Bert Gordon, Gordon Electric Co., Albert Lea.

New Directors (For three year term) G. L. Haugland, Appleton; A.

M. Kohler, Hibbing; Leo P. Kemp, Winona; Directors to Midwest Electrical Council: Sam Newstone, Montevideo; John Ellenbecker, St. Cloud; Eric G. Nylund, Duluth; Ed N. Karst, Fergus Falls, Minn.; Wm. A. Ritt, St. Peter.

Midwest Electrical Council, Inc., Pres., F. M. "Jerry" Tripp, Tripp Electric Co., Minneapolis, Minn.; Vice Pres., Clyde Kieley, Grafton Electric Shop, Grafton, N. D., Secy., Wm. A. Ritt, Ritt Electrical Center, St. Peter, Minn.; Treas., W. Arthur Starbird, Starbird Electric Co., Minneapolis, Minn.

Directors (All from Minnesota) Edward W. Linner, Stillwater; G. L. Haugland, Appleton; Moreau Bailey, Albert Lea; Wm. S. Johnson, Duluth; Paul Schorr, Sr., St. Paul; Don F. Kehne, St. Paul; Al W. Strohmeier, Minneapolis; W. Arthur Starbird, Minneapolis.

Directors to North Central Electrical Industries, Paul C. Schorr, Sr., Commonwealth Electric Co., St. Paul, Minn., Moreau Bailey, Bailey Electric Co., Albert Lea, Minn., Manager, Gordon Tucker.

Minnesota Electrical Inspectors Association, Pres., Karl Mertz, Northern States Power Co., St. Paul, Minn., Vice Pres., William Patenaude, REA Inspector, Anoka, Minn., Secy-Treas., Glenn Rowell, Electrical Engineer, Fire Underwriters Inspection Bureau, Minneapolis, Minn.

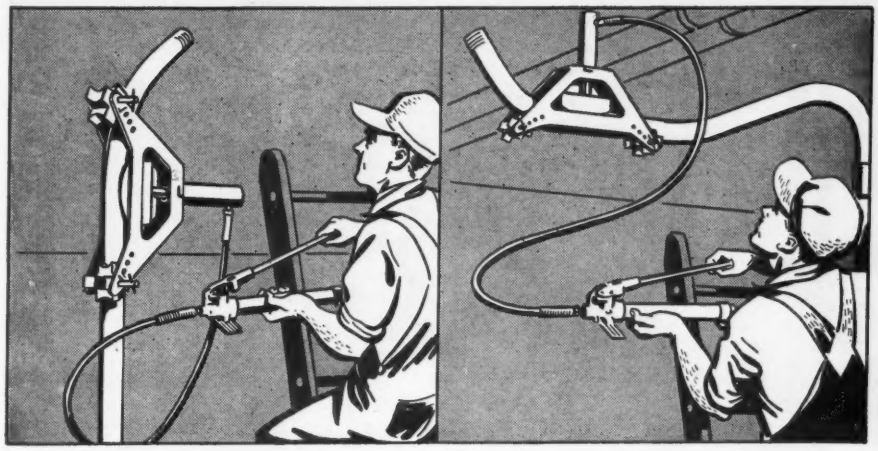
Wiring Conference Held in Chicago

More than a hundred representatives of the electrical industry registered at the annual Adequate Wiring Conference, sponsored by the National Adequate Wiring Bureau in Chicago, February 24th and 25th.

Panel discussions covered problems encountered in training adequate wiring sales personnel and in promoting adequate wiring at fairs and home shows. Individual presentations touched on the current economic situation and its effect on promotional activities; on selling better wiring to consumers; on the promotion of adequate wiring, "kitchenizing" and planned lighting as a "harmony trio"; on converting the industry's employees into a tremendous sales force for adequate wiring; on home service and adequate wiring working together; and on the success of a wiring certification program in a typical locale. The program concluded with an open forum discussion on various wiring promotional problems.

A. H. Jones, general sales manager

You Get 4 Exclusive Advantages with a Blackhawk Pipe Bender



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A Blackhawk Porto-Power Pipe Bender is completely versatile. It works in any position — vertical — horizontal — or at any angle. The remote control Porto-Power pump makes this extra utility possible.

3. TAKE IT RIGHT TO THE JOB
A Blackhawk pipe bender's light weight and all-directional operation lets you bend pipe right at the installation instead of lugging pipe to the bender. Saves time — work — steps — makes it easier to fit bends to obstructions.

2. DO OTHER WORK
The Blackhawk Porto-Power hydraulic unit detaches to work with numerous other Porto-Power attachments to handle dozens of lifting, pulling, pushing, clamping, pressing, bending and spreading operations.

4. ELECTRIC OPERATION IF DESIRED
P-182 electric pump permits *fingertip control* pipe bending — speeds work —leaves hands free for measuring. Ideal for continuous bending of elbows, etc. P-182 also can convert any other hydraulic equipment to power operation.

S30A Pipe Bender with 10-ton hydraulic unit handles rigid conduit and pipe in 1, 1¼, 1½ and 2" diameters.

S36 Pipe Bender with 20-ton hydraulic unit handles rigid conduit and pipe from 1¼ to 4" in diameter.

Your Blackhawk Industrial Supply Distributor will give you full information on cost-cutting Blackhawk Porto-Power Pipe Benders.

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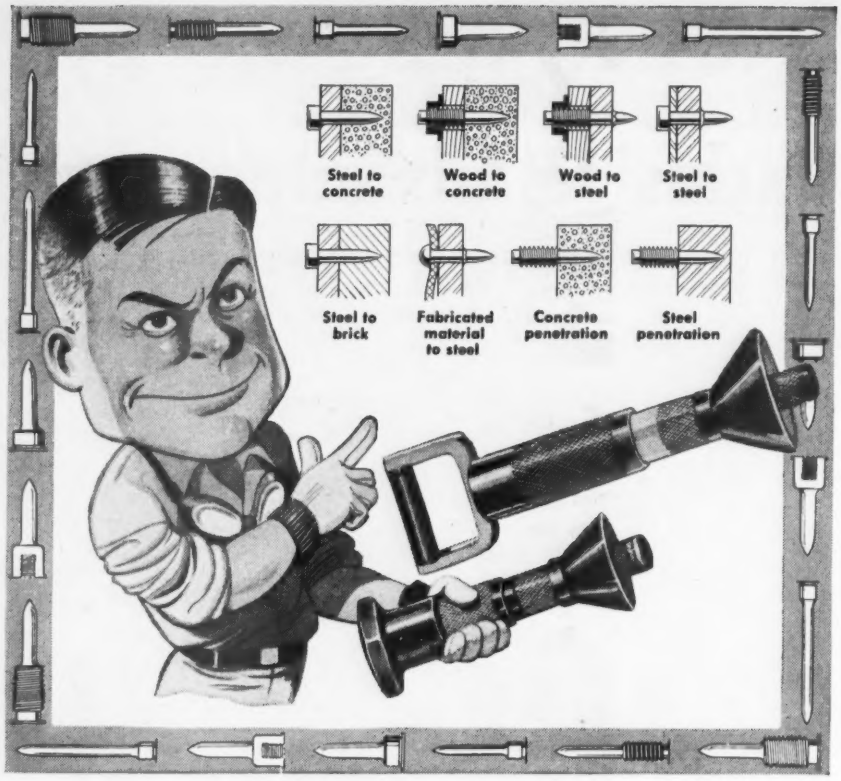

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For fastenings in steel, concrete and other hard-to-work materials, RAMSET pays big dividends in time and money. Use the coupon for complete information.

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of the Madison Electric Company in Detroit and representative of the National Electrical Wholesalers Association on the National Adequate Wiring Bureau's Plan Committee, served as general chairman at the Conference.

The keynote address was given by N. J. MacDonald, vice president of The Thomas & Betts Company and chairman of the National Adequate Wiring Bureau's Executive Committee, who assailed the current defeatist thinking of many inside and outside the industry. They are convinced, he stated, that depression, recession and war are just around the corner and that nothing can be done about it. Constructively minded people, he emphasized, do not fall prey to such philosophies.

"Without vision," he pointed out, "the people perish. And just as surely without vision, so does the salesman."

Painting a vivid picture of what the Adequate Wiring Program means in terms of new business if 1,000,000 new homes a year are adequately wired, MacDonald urged those present to visualize the market possibilities so clearly they could "convey it to others.

Following MacDonald's keynote address, M. R. Norton, dealer coordinator for the Wisconsin Power and Light Company and secretary of the Central Wisconsin Adequate Wiring Bureau, staged for those present a lecture demonstration he has developed to sell better wiring to consumers. Entitled, "What Do You Do In Your Bedroom?", the demonstration dramatized the many present day uses of electrical appliances and lighting in the bedroom and contrasted the woefully inadequate wiring generally installed.

"Thirty percent of fuse failures are attributable to inadequate wiring," pointed out Merrill E. Skinner, vice president of Union Electric Company of Missouri, in his speech Kitchenizing, Planned Lighting, Adequate Wiring—The Harmony Trio.

R. E. Carland, sales promotion manager of U. S. Rubber's Wire and Cable Department and Chairman of a NEMA Adequate Wiring Subcommittee, then described for conferees NEMA's new employee educational program on adequate wiring. Recently launched by NEMA member companies, the program has had excellent response.

Every national survey made during the war, pointed out R. H. Giedd, new business manager for Florida Power Corporation, in his presentation, Certification Was Our Answer, indicated that major electrical appliances were among the top items in postwar buying intentions. In consequence, he asserted, Florida Power Corporation determined to survey customers in its territory to ascertain the "probable

plant expansion needed to meet the growing demands for electric service". A preliminary survey, conducted in the St. Petersburg area, disclosed the unexpected fact that more than 75 percent of new home construction would "go all-electric". Carrying the survey one step further, the utility interviewed 50,000 more individuals in outlying areas.

The conference concluded with an open forum discussion under the guidance of J. J. Dore, managing director of the Nebraska-Iowa Electrical Council, Inc. Discussion topics included problems connected with the application of Certification standards; selling the speculative builder, consumer and electrical contractor; working with FHA and savings and loan companies; providing layout service and financing adequate wiring promotion.

RECA Wins New Contract Revisions

Three years ago (Feb. 1946) a group of rural hi-line contractors met in Chicago to protest the policies of REA and the various electric cooperatives and formed the Rural Electrical Contractors Association. Since that time the organization's officers and committees have been camping on REA's doorstep determined to foster better contractual relationships between REA components and the contractors. More specifically, they sought construction contract revisions that would eliminate "blind" bidding resulting from insufficient co-op engineering data; also prompt payments that would release contractor dollars tied up in completed lines.

RECA reaped the fruits of its labors at its fourth annual convention held in Chicago's Edgewater Beach Hotel, Feb 24-26. J. K. O'Shaughnessy, REA chief engineer, reviewed a new construction contract that incorporates practically all of RECA's suggested revisions. Exceptions: Contractors must still list suppliers' names on the bids; must still obtain release of liens. Major revisions include:

Payments—Co-ops must pay all monthly estimates within 15 days after due date; completed sections or projects within 30 days. Penalty for failure—payment to contractor of interest at 6 percent per annum on his unpaid bills. New scheme may prevent co-op misuse of construction funds.

Plans and Specifications—Clearer definition of complete project, assembly units, line changes, conversion units, etc. Staking maps will be included. Contractor will have complete picture before bidding.

FULLMAN Latrobe PRODUCTS

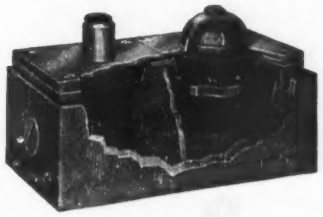
FLOOR BOXES — WIRING SPECIALTIES

FULLMAN MANUFACTURING CO. QUALITY AT LATROBE SUPREMACY LATROBE, PA.

Easy to install . . .

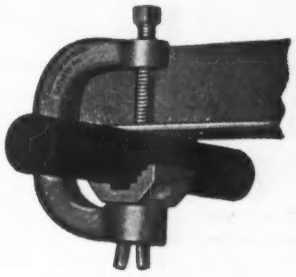
The simple, compact make-up of "Latrobe" Floor Boxes and wiring Specialties permits them to be installed in record time.

The savings in time, labor and actual dollars thus gained is further improved by their smooth, dependable service after installation.



No. 252-R "Latrobe" Two Gang Box

Adjustable with No. 208 Receptacle in one section. One Cover Plate has ½" Flush Brass Plug; other has 2" Flush Brass Plug.



No. 470 "Latrobe" Pipe or Conduit Hanger

Made of highest grade malleable iron and cadmium plated, the No. 470 is unexcelled for hanging ½", ¾" and 1" pipe or conduit to steel beams up to ⅜" thick. Larger hangers for larger pipe.

No. 280 Nozzle with No. 200 Cover Plate

10 Amp. 250 Volt Receptacle in Brass Housing, mounted on ½" brass pipe extension 3" long—longer if desired.

No. 110 "Latrobe" Watertight Box

Simple and compact in design the No. 110 Non-Adjustable Watertight Floor Box is quick to install and gives trouble-free service. 208 Receptacle. Cover Plate 3½" diam.

No. 284 Nozzle with No. 200 Cover Plate

Neat, compact-fitting and extremely durable, this Duplex Receptacle Nozzle does fine job with either ½" or ¾" brass pipe extension.

Sold Only Through Wholesalrs

Tom Thumb Utility Outlet

Excellent for use in wood floors, mantels, baseboards, show windows and other installations free from moisture or mechanical injury. Only 2½" diam. and 2" high.

FULLMAN MANUFACTURING CO.
LATROBE . . . PENNSYLVANIA

NOW!

TRADE ARRO MARK

ANCHORING DEVICES

FOR THE ELECTRICAL TRADE

Since its founding in 1930, ARRO has won recognition as one of the nation's major manufacturers of expansion bolts and other anchoring devices, serving the hardware, mill supply and plumbing supply trades. For years, our goal has been to increase our service to the electrical field.

NOW . . . after long preparation and planning . . . we offer you ARRO products. Manufacturing facilities have been expanded . . . additional items have been taken into the ARRO line to serve electrical contractors and maintenance men . . . distribution channels are being enlarged.

FOR ALL KINDS OF MASONRY - -

The Anchoring Devices You Want . . . . .

Machine Screw Expansion Anchors in sizes from 6/32 screws to ¾" bolts inclusive.

Two-Wing Spring Type Toggle Bolts in Screw sizes ⅛" to ½" inclusive.

. . . . and the Tools You Need to Use Them

Arro-Spin Drills — Genuine Carboloy cemented carbide tips — for electric rotary drills. Round and fluted shanks; broad range of sizes.

A full line of Arro Star Drills in sizes from ¼" to 2" diameter; lengths to 24".

If your distributor doesn't have ARRO products, write us for name of ARRO distributor nearest you.

ARRO EXPANSION BOLT COMPANY

MARION, OHIO

Construction Schedule—Definite construction sequence in form of a numbered map will be included; line de-energizing time schedule for line extension work. Owner no longer can order shifts in contractor crews to suit his own desires.

Definite Quantities—Engineers no longer can change pole locations, material quantities, unit assemblies, etc. Job will go in as per plans and specifications. Changes must be made under a construction contract amendment with additional compensation for same.

Time Extensions—Liberalized time extensions for delays due to weather or working conditions.

Materials—Contractors will supply all materials except conductor and transformers. Co-ops must have their materials on hand or definite promise of materials when needed before project is bid.

Bidding—Bidders must start work within 30 days after receiving written notice of contract approval from the Administrator (formerly 10 days after notice from engineer). These 30 days not included in construction time. Bid bonds accepted instead of certified checks.

These changes definitely favor the contractor and should reduce construction costs. They may even induce a number of the better operators to return to REA work. REA fervently hopes they will. But the contractors still have a few drums to beat. Force Account Work (construction by co-op crews) on large projects will be the next RECA target. REA likes this no more than the contractors, stated O'Shaughnessy who placed the responsibility squarely on the contractors. Lack of bidders has forced co-ops to do their own work to get the lines built, he added. Whether these co-ops with large investments in tools, equipment and trained crews will welcome the contractor remains to be seen.

RECA also would like to see contractors and consulting engineers meet specific, rigid qualifications to weed out the incompetents; wants co-ops to make project cost estimates prior to bidding—if low bid is within 10 percent of this estimate it should be awarded. Goal: eliminate repeated bid rejections.

Despite the fact that 72 percent of the nation's farms are electrified at present, there is still a big job ahead, stated George W. Haggard, Assistant REA Administrator. Loan applications now on file request over 350 million dollars for new construction and line improvements. REA approved loans, to date, total approximately 1½ billion dollars to 955 rural electric co-ops, 43 public power districts, 22 other public bodies and 24 commercial power

companies, he revealed. Of this, about $1,100,000,000 has been advanced on completed construction including 750,000 miles of line and other facilities serving approximately 2½million rural consumers. In addition, REA borrowers purchase annually about $20,000,000 worth of wholesale power from the electric utility industry, he added.

Congressional REA appropriations to date total $1,875,428,288 ($1,350,000,000 since July 1, 1945) and some $233 millions are still available for loans, J. K. O'Shaughnessy stated. Possible increase: the $350 millions in the President's budget. In 1948 REA built a record 154,933 miles of line, compared with an estimated total of 157,332 miles for private utilities for 1947–1949, and O'Shaughnessy sees an even bigger mileage for this year. Only limitations will be availability of material and contractor manpower.

With some 25,000 miles of bare poles set, REA is in dire need of conductor to complete these lines and meet the remainder of its program requirements. Hence the insistence that co-ops furnish all conductor (and a possible underlying reason for the much discussed Reynolds-Wisconsin Electric Co-op deal). Inability of contractors to furnish materials in time to complete scheduled construction has kept the conductor out of the new contract, O'Shaughnessy pointed out adding that competition would be stifled if a few contractors able to meet their conductor commitments were permitted to do a number of projects.

Of the record 1948 mileage, about two-thirds were built under contract—most on a labor-only basis. The remainder was built under force account. REA and RECA hope for a larger percentage of contract work in the future.

Meeting of NECA District One

The third annual meeting of District One, comprising NECA members in the eight northeastern states, will be held in Boston at the Hotel Statler on Monday, April 25, under the auspices of the three New England Chapters: Boston, Central Massachusetts, and Rhode Island and Southeastern Massachusetts.

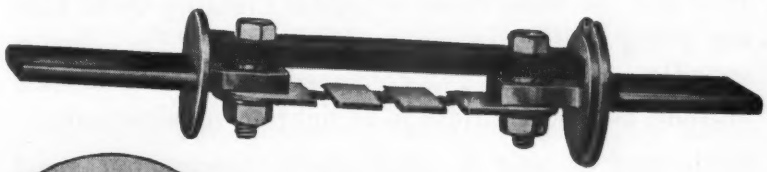
This meeting has been arranged particularly to cover intra-association matters and to allow sufficient forum time for the members to participate in discussion at both the morning and afternoon sessions.

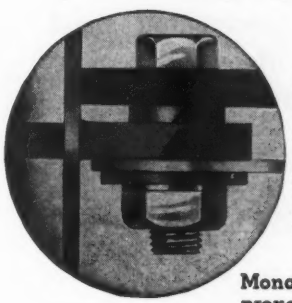
The guest speakers from NECA headquarters will be Executive Vice President Paul M. Geary, reporting

New POSITIVE LOCK
Construction of
Monarch Renewable Fuses
Assures →
TRUE ALIGNMENT

The brass lugs inside the caps used on Monarch Fuses (see illustration at right above) fit into equally spaced slots in the brass casing inserts. This new and improved Monarch construction assures true alignment of the copper holding terminals . . . and establishes a positive lock on both ends of the fuse.

and for
STILL GREATER PROTECTION . . .





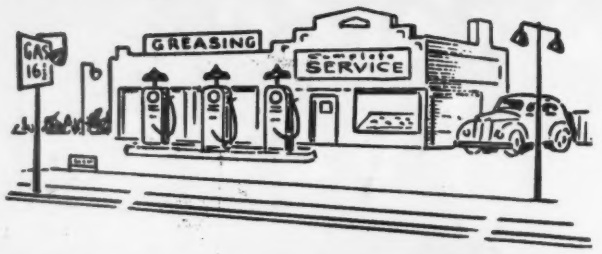
MONARCH'S Compressed Tension Lock Washer construction (illustrated at left) compensates for contraction and expansion of the fibre bar by exerting constant tension on the bar . . . and assures no loose parts. The washer also separates the fibre bar from the copper terminals . . . a spacer to provide better cooling.

Monarch Fuses are fully approved and are available through recognized wholesalers.

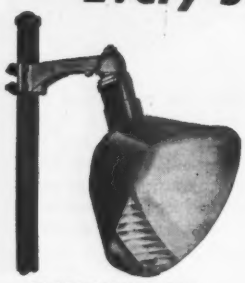
Specify Monarch Fuses
for improved
FUSErvice

MONARCH FUSE CO., LTD.
118 E. FIRST ST., JAMESTOWN, N. Y.

QUAD LIGHTING

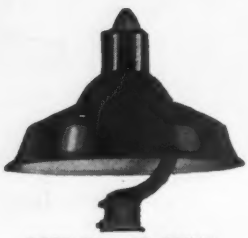


CORRECTLY ENGINEERED FOR
Every Service Station Layout



FLOODLIGHTS FOR AREA LIGHTING

ANGLE REFLECTORS FOR SIGNS



POST TOP OR PUMP REFLECTORS

Here are the three types of QUAD Lighting Units that are being widely used in service stations. Each has a specific application and combined they afford service stations complete coverage of lighting requirements.

Each type of unit is substantially constructed, most practical in design, highly effective in illumination value and does a job in adding good appearance to any service station.

The Spade Sign Reflector is designed for small and medium sized signs—does not obstruct view of sign, is rustproof—weatherproof—easy to wire.

The newly designed Post Top Reflectors have a wireway for an auxiliary spot light. The support is of one-piece.

Our "Six Thirty" Floodlights for open wiring are designed to clamp around 1½ to 2½ inch iron pipe standards or may be bolted to wood or steel cross arms or to wall surfaces.

Read about the line in our catalog—sell them for year 'round good profit.

QUADRANGLE MFG. CO.
32 S. PEORIA ST. CHICAGO 7, ILL.

on Association details; Technical Director Ray Ashley, talking on research and estimating costs; Labor Relations Director S. J. Cristiano, covering the labor situation; and NEBF Treasurer Laurence W. Davis speaking on the National Pension. There will also be a talk on time-saving tools and methods as developed by the Joint Industry Board of New York City. Vice President Lincoln Bush will preside.

Jersey Exposition Is Huge Success

Breaking all previous attendance records, the Essex Electrical League of New Jersey terminated its fifth annual Industrial Exposition on March 11th with a registration list of over 2600 specially-invited and ticket-admitted contractors, industrial engineers, wholesalers, electrical maintenance men, manufacturers, consultants, architects and purchasing agents from the northern Jersey metropolitan area.

Sponsored by the League's Manufacturers' Division, the 4-day show displayed a comprehensive presentation of new and improved electrical products, equipment and accessories in 64 brilliantly decorated and illuminated booths erected in the Terrace Room of the Mosque Theatre in Newark.

In formally opening the Exposition, L. E. Latham, president of the League and vice president of the E. B. Latham Company, participated in a half-hour radio program broadcast over station WNJR. The program, which included a brief visitation and discussion of some of the outstanding exhibits, also paid tribute to Exposition Chairman Nathan Eglowstein of the General Lighting Products Co., and to the arrangements completed by the Manufacturers' Division which is chairmanned by James Kennedy of the Harvey Hubbell Co.

Book Reviews...

Standard Handbook for Electrical Engineers

The combined work of 101 electrical engineering authorities is contained in the recently-published eighth edition of the "Standard Handbook for Electrical Engineers" which includes all relevant information previously published plus the many new developments and improvements in electrical equipment and its application since the release of the pre-war seventh edition.

Archer E. Knowlton, Editor-in-Chief; and R. M. Shoop, Assistant Editor; both of whom are on the editorial staff of *Electrical World*, have included facts and figures, systems and measurements, materials and methods, authoritative standards, developments in equipment and methods from all fields of electrical engineering in this 2311-page handbook. Included in the comprehensive 26-section presentation are the latest developments in radar and associated microwave techniques, nuclear energy, induction and dielectric heating, new elastomers and plastics, new standardizations, and other equally interesting subjects. A complete recasting of material on conductors, a revamping of the sections on generators and transformers, a complete cross-referenced index, a table of contents for each section and an extensive bibliography makes the work a concise, clear reference and working tool.

Representative section-headings indicate the Handbook's scope: Illumination, industrial and commercial power, electric heating and welding, wiring design, commercial and industrial buildings, electronics and electron tubes, codes and standard practices, prime movers, power transmission, power distribution, properties of materials, electrochemistry and electrometallurgy. Priced at $12.00, it is published by the McGraw-Hill Book Company.

Dates Ahead

National Country Life Exposition—Commercial Museum, Philadelphia, Pa., Week of April 11.

Western Metal Congress and Exposition—Shrine Convention Hall, Los Angeles, April 11-15.

Midwest Power Conference—11th annual conference, Sherman Hotel, Chicago, Ill., April 18-20.

National Electrical Wholesalers Association—41st Annual Convention, Netherland Plaza Hotel, Cincinnati, Ohio, May 1-6.

Chamber of Commerce—37th annual meeting, Washington, D. C., May 2-5.

National Fire Protection Association—53rd annual meeting, Fairmont, Hotel, San Francisco, Calif., May 16-19.

National Industrial Service Association—Annual convention, Hotel Jefferson, St. Louis, Mo., June 9-11.

Store Modernization Show—Grand Central Palace, New York, June 19-24.

New York State Association of Electrical Contractors and Dealers, Inc.—Saranac Inn, N. Y., June 25-July 1.

Illuminating Engineering Society—National Technical Conference, French Lick, Ind., September 19-23.

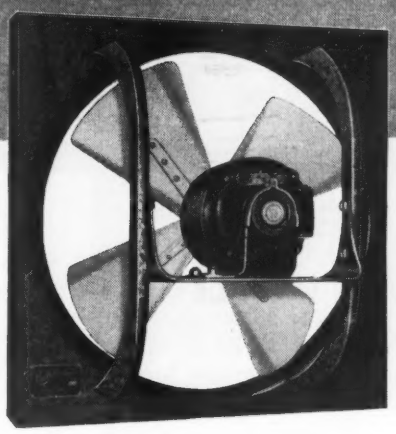
National Electronics Conference—Edgewater Beach Hotel, Chicago, Ill., September 26-27.

International Association of Electrical Inspectors—Eastern Section, Hotel Statler, Boston, Mass., Aug. 11-13; Western Section, Hotel Statler, St. Louis, Mo., September 26-28; Northwestern Section, Butte, Mont., October 3-5; Southwestern Section, Hotel San Diego, San Diego, Calif., October 10-12; Southern Section, Hotel Shamrock, Houston, Texas, October 17-19.

National Electrical Contractors Association—Annual convention, Rice Hotel, Houston, Texas, November 7-10.

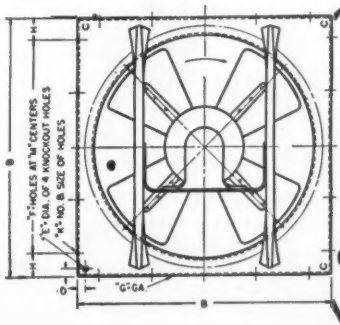
National Electrical Manufacturers Association—Chalfonte-Haddon Hall, Atlantic City, N. J., November 13-18.

HEAVY on Performance
LIGHT on Maintenance
—a Real Profit Builder



"Buffalo" TYPE "NV"
HEAVY-DUTY BREEZO FAN

HERE Is an easily installed "Buffalo" panel disk fan to ventilate large areas under pressures up to ¼"! In seven sizes, 12" to 36" to deliver up to 15,000 cfm, it's built RUGGEDLY. The die-stamped panel, arms and motor bracket are strong and rigid to STAND UP. The four sturdy blades are shaped to move MAXIMUM AIR on very little power. Resilient-mounted, top grade motor means quiet service. Easy to sell, install and service—write for Bulletin 3222-F and your profit facts NOW!

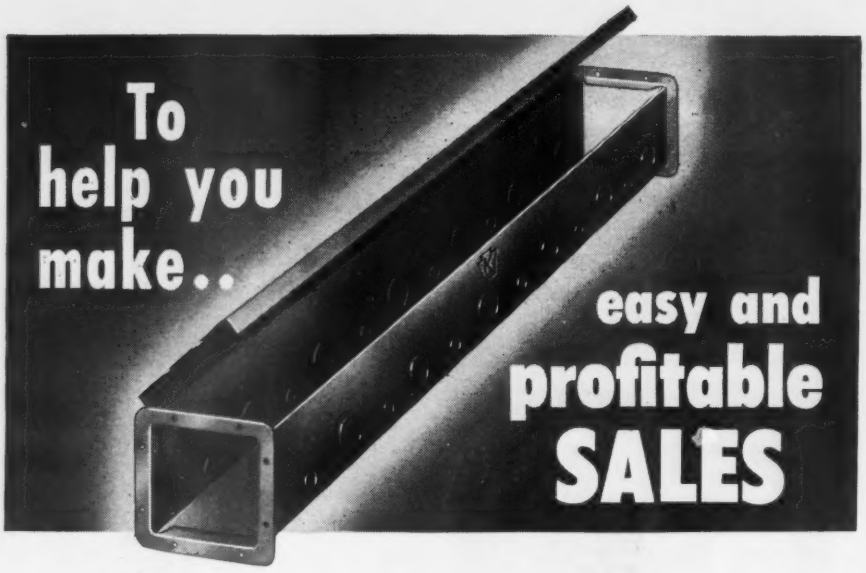


Combining simple, rugged design with easy installation

"Buffalo" First For Fans

BUFFALO FORGE COMPANY
520 BROADWAY BUFFALO, NEW YORK
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.
Branch Offices in All Principal Cities

PANEL BREEZO FANS BELTED VENT SETS BELT-AIR FANS
BREEZ-AIR ATTIC FANS "L" BREEZO FANS "NV" BREEZO FANS



These Keystone Interchangeable square Wireways are meeting a recognized need at a very attractive price. Made in 1 to 5 ft. lengths in two popular widths, 4 inches and 6 inches square—with hinged cover for easy access to wiring—knockouts on side and back—furnished in black baked enamel (galvanized furnished for coastal areas).

Introducing Keystone's New
FLANGELESS WIREWAY

With knockouts ½" to 1½", spaced alternately 3 inches apart, greatly facilitating electrician's work. End plates provided with knockouts to accommodate pipe up to 2½" so no cutting is necessary in making connections to panel or meter boards. T's, L's and connectors also available.

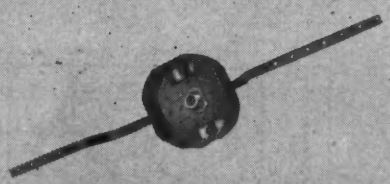
ASK ABOUT our new 90° Elbow and Pull Box with "smooth-flow" corner. Has hinged cover and ample knockouts. Available 4" x 4" and 6" x 6".

OTHER FITTINGS

DROP HANGERS • NIPPLES
TROUGH COLLARS
BRACKET HANGERS
CLOSING PLATES • "T" FITTINGS
JUNCTION BOXES

All fittings made in standard 4" x 4" and 6" x 6" and interchangeable

OCTAGON CABLE BOXES



Mounted on offset hanger bars in choice of 3 forms—straight, shallow and deep. Can be had either with double ½" knockouts or with Romex Cable Clamps—4 inches square—black enamel (galvanized for coastal areas).

All Keystone equipment Underwriters Laboratories Approved

Let us send you illustrated catalog sheets showing sizes and other information, along with attractive prices.

MEET US IN BOOTH 41 AT NEWA CONVENTION

IMMEDIATE DELIVERY

KEYSTONE MFG. CO.
23328 Sherwood Road • Center Line (Detroit), Mich.

New officers of the Electrical Maintenance Engineers of Milwaukee are: (L to R) President—Royal H. Betzhold, maintenance electrician, Fox Theaters, Milwaukee; Secretary — Erwin C. Siller, chief electrician, Phoenix Hosiery Co., Milwaukee.

Manufacturers News

A. T. Bergeron Named V. P. of Miller Company

At a recent meeting of the board of directors of the Miller Company, Meriden, Conn., Albert T. Bergeron was elected a vice president of the company.

Mr. Bergeron has been with the Miller Company for 24 years. He be-

A. T. BERGERON

gan with the company in a sales capacity in the northwest territory. He was made district sales manager of the West Coast territory in 1937, operating out of San Francisco. In 1946 he was made sales manager of the Company's Illuminating Division with headquarters in Meriden and he will continue the direction of sales and overall operation of this division.

Wesco Changes

Announcement has been made of the opening of a new Westinghouse Electric Supply Company house in the Midwest district to be known as the Fyler branch, located at 5049 Fyler Ave., St. Louis, Mo., with C. J. Cox, Jr. as branch manager.

A. H. West has been named North Pacific district farm sales supervisor for WESCO, with headquarters at Seattle, Wash.

J. R. Place has assumed the duties of manager of the Binghamton, N. Y. branch, succeeding W. L. Nisbet, resigned. Prior to this appointment, Mr. Place was manager of the Watertown house. He has been replaced in that position by J. P. Keim, formerly in the quotation department of the Rochester branch.

Joseph Simmons has been appointed Albany, N. Y. manager, succeeding R. H. St. John, resigned.

Joseph G. McKinley has been named Northern California district farm sales supervisor, with headquarters at San Francisco.

Duties of Northwestern district lamp manager with headquarters at Chicago, Ill., have been assumed by Joseph T. Tasch. He was formerly Metropolitan Chicago lamp sales supervisor.

E. C. Eck has been named Roanoke branch manager, succeeding R. V. Nash, resigned.

Graybar Announcements

E. E. Martin has been named New England District manager at Boston of the Graybar Electric Company. He succeeds W. H. MacCrellish who has been district manager at Boston since 1943 and is now retiring after 41 years of service with Graybar.

On March 1, J. R. Ernest assumed the duties of district operating manager at Kansas City.

W. R. Windfield has been appointed district operating manager at Graybar Seattle.

Other appointments are John Reine manager of the Portland, Ore. branch; R. J. Franzen manager of the Tacoma branch; J. R. Feeney manager of Chattanooga branch; and R. L. Coward manager of the Bristol branch.

Cornell-Dubilier Appointments

Alfred S. Gartner has joined Cornell-Dubilier Electric Corporation's sales organization as assistant to Arthur Williams, sales manager of the capacitor manufacturing division. Mr. Gartner was formerly with the Solar Manufacturing Corp.

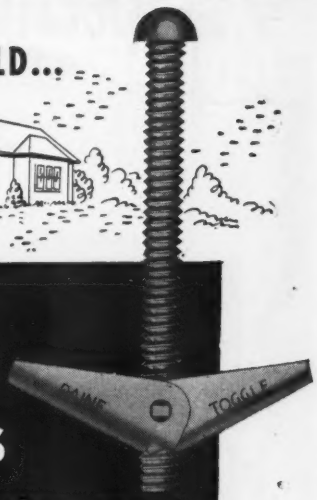
Announcement has been made of the appointment of Alcide Prosdocimi as director of its export activities.

Cornell-Dubilier has opened a Mid-

THE BEST CRAFTSMEN ALWAYS TAKE PAINE'S...

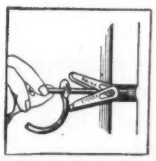
IN NEW BUILDINGS OR OLD...

PAINE
Spring Wing
TOGGLE BOLTS
cut fastening and hanging costs

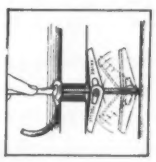


Whether you are building a new home or office or are repairing an old building you'll have no fastening problems if you use Paine Spring Wing Toggle Bolts. Spring Wing Toggle Bolts provide a secure and permanent fastening in hollow walls and ceilings and other hollow spots where it is impossible to reach the other side. They may be used in wood, gypsum, marble, lath and plaster, tile and sheet rock. They are especially useful for installing heavy shelves, partitions, wall mirrors, lights, and plumbing fixtures.

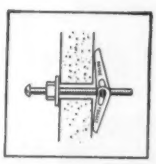
For the big user, try Paine's Toggle Bolt Clamp that grips the bolt when it is to be tightened, so it can be tightened with a screwdriver. It cuts installation time in half and saves the mechanic's fingers. Get Paine Toggle Bolts from your supplier today.



Just drill a hole. Unscrew wing. Put bolt through item to be fastened. Thread wing back on bolt. Push wing through hole.



The wing springs open when through hole. Pull on bolt while tightening to prevent wing turning.



When hanging objects that must be moved periodically, use a nut and washer as shown above.

THE PAINE COMPANY

2961 Carroll Avenue — Chicago 12, Illinois

OTHER PAINE PRODUCTS

Anchors · Hangers · Superior Features · Builders Specialties

Spring Wing Toggle Bolts
Expansion Anchors
"Sudden Depth" Drills
Wood Screw Anchors
Pipe and Conduit Clamps and Straps
Hanger Iron, perforated
Expansion Shells
Star Drills
Malleable Shields
Special Hanging and Fastening Devices

WRITE FOR CATALOG

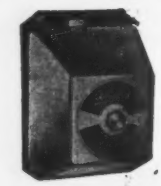
Specify National INSULATING MATERIALS

For Long Life and Reliability

Adhesives
Cements
Compounds
Enamels
Fabrics
Fiberglas
Laminates
Mica Products
Papers, Fibres
Silicones
Sleevings
Tapes
Tubings
Varnishes

If you have a *special* electrical insulation problem — heat, moisture, oil, acid, etc. — which causes persistent trouble — *that's* where we shine. For years and years we have studied the problems of the man who has more than the ordinary insulation problem. We have found ways to lengthen insulation life under adverse conditions. We developed Mica-Glas, all-inorganic. We were among the first to apply the advantages of silicone to insulation. Then, to bring such experience to you we placed factory-trained engineers in the field. One is near you *now,* waiting not just to sell insulation but to help you profit by its use. Use him. Tell him your problem. He's equipped to solve insulation problems, and that's his job. Call him in; if you don't know him, write or wire us.

NATIONAL ELECTRIC COIL COMPANY
COLUMBUS 16, OHIO, U. S. A.
ELECTRICAL ENGINEERS MAKERS OF ELECTRICAL COILS AND INSULATION
REDESIGNING AND REPAIRING OF ROTATING ELECTRICAL MACHINES
TRADE MARK



AUDIBLE SIGNALS

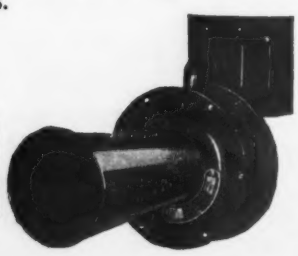
BELLS • CHIMES • HORNS

Single stroke Bells for multiple or series circuits. Vibrating Bells for operation in multiple only. 4" to 20" sizes, indoor and outdoor.

Special tone Signals: musical and soft tone Bells, Chimes, Cow Gongs, Horns and Whistles.

Also contactless vibrating and explosion-proof Bells.

WRITE FOR 32-PAGE CATALOG



RELAYS • SIGNALS • CODE CALL AND FIRE ALARM SYSTEMS

SIGNAL ENGINEERING and MANUFACTURING COMPANY
154 WEST 14th ST. • NEW YORK 11, N. Y.

west direct factory sales office at 605 North Washington Avenue, Chicago, under the supervision of Charles H. Caine, vice president of the company. Mr. Caine has resigned from his partnership in the Caine Sales Company, which formerly represented Cornell-Dubilier.

Vernon C. Macnabb will represent the company at its manufacturer customers in Michigan. His office address is 915 Westfield Blvd., Indianapolis, Ind.

Westinghouse Appointments

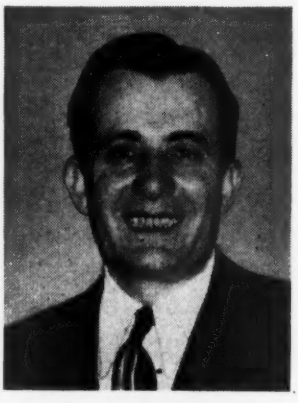
F. E. Baker has been appointed manager of the specialty transformer department in the transformer division at Sharon, Pa., of the Westinghouse Electric Corp. He succeeds C. H. Bartlett, who has recently been appointed manager of power transformer sales for the transformer division.

John M. Nelson, who was formerly in charge of relay sales in the meter division, Newark, N. J., becomes manager of meter sales and J. F. Chapman succeeds him as manager of relay sales.

Carl R. Busch has been appointed district sales engineer for the Westinghouse Lamp Division's eastern district. He will cover New York state and northern New Jersey from his headquarters at 40 Wall St., New York City.

Jules Levenstein Acquires Ender Corp.

Announcement has been made by the Ender Manufacturing Corp., 260 West Street, New York City, that the entire interests of the Corporation have been acquired by Jules Levenstein.



JULES LEVENSTEIN

Mr. Levenstein, long associated in the lighting industry, and many years part owner of the Ender Manufacturing Corp., will continue to carry out the progressive policy in the manufacture of commercial and industrial luminaires.

General Electric Changes

S. W. Corbin has been appointed assistant manager of the Industrial divisions of General Electric's apparatus department. He is also manager of the resale industries division, a position he assumed in 1943 and will retain along with his new appointment.

According to a recent announcement by Theodore F. Foster, manager of the accessory equipment division of G-E's construction materials department, the following appointments have been made:

Ralph A. Brown has been named supervisor of commercial scheduling. He will be responsible for the control and scheduling of finished stocks of accessory equipment going direct to customers or into warehouses.

William W. Marden has been named supervisor of order service. Fay C. Ralph has been appointed commercial engineer for the division, with duties assigned by the manager.

Sylvania Appointments

S. B. Williams has been appointed manager of public relations of Sylvania Electric Products, Inc. Mr. Williams joined the company in 1947 as manager of customer relations for the lighting division.

Appointment of R. G. Hamann to manager of chain store sales for Sylvania has been announced. He will be responsible for lighting sales to grocery, drug and variety chain stores.

Chicago Lighting Manufacturers Assn.

Chicago area manufacturers of lighting equipment have formed a nonprofit organization incorporated as the Chicago Lighting Equipment Manufacturers Association. The organization was formed for the purposes of representing its members before legislative groups; negotiating uniform labor contracts for its members and their employees; and, in general, applying collective effort toward the solution of problems common to the industry.

Officers of the corporation are: president, M. C. Wilt, Curtis Lighting, Inc.; vice president, K. B. Lacy, Lighting Products, Inc.; secretary, L. K. Schoenbrod, Electro Manufacturing Corporation; and Treasurer, B. A. Mitchell, Mitchell Manufacturing Co.

Directors are: M. C. Wilt; K. B. Lacy; L. K. Schoenbrod; Max Klein, All-Bright Electric Products Co., Louis Mided, Good Manufacturing Co.; John Roberts, Universal Fluorescent Lighting Corporation; and Al Riskind, Harvstone Manufacturing Co.

put the screws on COSTS

with FRANKEL clip tap

cut original costs! Frankel Clip Taps cost you less...⅓ to ½ less than "bug" type connectors in equivalent sizes!

reduce installation costs! Compact Frankel Clip Taps are speedier to install . . . only one small ordinary wrench is needed to tighten the standard hex head bolts instead of the oversize wrenches required to tighten the large nuts of split-bolt connectors. Faster, easier taping because of rounded edges and recessed bolts.

get these extra advantages! Frankel Clip Taps are the perfect connector for heavy duty service. Completely encircles and firmly forces conductors into high pressure contact. Lock washers keep it tight, always! No removable parts . . . no hardware to fall off in installation. Five sizes take all conductors from 2/0 to 1000 Mcm main with any size branch. Made of electrical bronze with noncorrosive Everdur bolts for extra strength.

Approved by Underwriters' Laboratories in all five sizes

Write today for descriptive sheet CT and price list.

SOLD THROUGH LEADING WHOLESALERS ONLY

Frankel Solderless Connectors

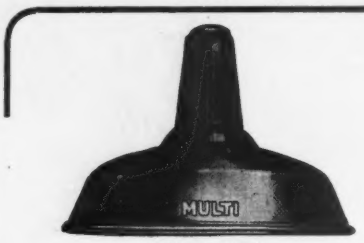
FRANKEL CONNECTOR CO.
27 VESTRY ST. • NEW YORK 13, N. Y.

42 YEARS OF KNOW-HOW IN SOLDERLESS CONNECTORS

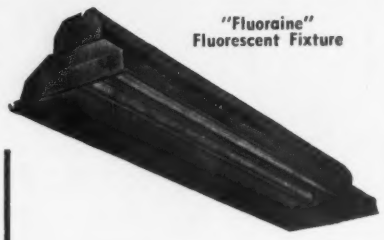
MULTI
INDUSTRIAL
LIGHTING
UNITS

. . . MULTI UNITS WILL HELP YOU DEVELOP PROFITABLE MARKETS

THE use of proper lighting units is getting added emphasis because of vigorous campaigns in the electrical field for adequate wiring. MULTI units fill an essential need in any such move. There are in this very complete line, units for every location—whether it is inside or outside—for general or local lighting—in fluorescent or incandescent types. There are sources of good business in lighting installations that hold tremendous promise . . . MULTI can help you get a good share.



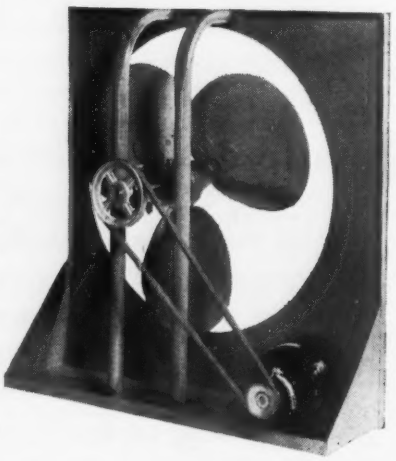
RLM Standard
Steel Reflector


"Fluoraine"
Fluorescent Fixture

• *Send for our complete catalog* •

MULTI ELECTRIC MFG. COMPANY
4223 W. Lake St. Chicago 24, Ill.

24 INCH EXHAUST FAN
with motor
$19.95
OD
28 x 28



This Coupon and $19.95 entitles you to a 24" belt drive exhaust fan complete with 110 volt 60 cycle motor. Regular $59.00 list. Order *must* be received before May 2, 1949. Shipment made in rotation only. Wholesale price usually $29.50 (also this price without coupon).

NAME: .....ECM
ADDRESS: .....
TYPE OF DEALER: .....
SHIP BY FREIGHT ☐ TRUCK ☐ EXPRESS ☐ PP ☐
SHIP C.O.D. ☐ CHECK ENCLOSED ☐ SEND OPEN ACCOUNT ☐ My D & B Rating is E2 or Better ☐

STANDARD ELECTRIC
MANUFACTURING CO., INC.
WEST BERLIN, NEW JERSEY

U. S. Rubber Changes

Appointment of Frederick P. Combier as sales manager and Robert C. Cassidy as chief engineer for Uskon electrical heating panels has been announced by C. W. Higbee, manager of the wire and cable department, United States Rubber Co. Both men will make their headquarters in the company's New York offices at 1230 Avenue of the Americas.

William M. Dougherty was elected secretary of United States Rubber Co. to succeed the late Eric Burkman. He has been associated with the company for 26 years and recently has been serving as assistant to the president.

Ten district sales managers have been appointed by the electrical wire and cable department, to supervise sales of electrical wire and cable in major cities throughout the country.

The new sales managers and their respective territories are as follows: C. W. Short, Boston; J. D. Drohan, New York; H. J. Cluver, Philadelphia and Baltimore; C. C. Hronek, Atlanta, Birmingham and New Orleans; E. W. Renfree, Detroit, Cleveland and Pittsburgh; G. E. Hubrig, Chicago, Milwaukee and Minneapolis; L. E. Dickinson, St. Louis, Cincinnati and Indianapolis; A. B. Gangwer, Kansas City, Tulsa, Omaha and Denver; R. S. Keith, Dallas and Houston; and L. M. Guibara, Los Angeles, San Francisco, Portland, Seattle and Salt Lake City.

•

Day-Brite Lighting Inc. of St. Louis, Mo. has announced the appointment of George J. Taylor as eastern sales manager. He will cover the New England states, New York State, Pennsylvania, New Jersey and Washington, D. C.

•

Research and development of safety equipment for all industries including the electrical industry, will be undertaken in a new laboratory to be built at Pittsburgh by **Mine Safety Appliances Company.**

George H. Deike, president of the firm, has announced plans for the construction of the four story laboratory building which is expected to be completed in September.

Facilities of the laboratory will be made available to all industry for the investigation of safety equipment problems affecting health and property, Mr. Deike explained. Dr. William P. Yant, director of research and development for the company since 1936, will have charge of the research laboratory.

•

Buchanan Electrical Products Corp., Hillside, N. J. announces the appointment of Conrad F. Bond, 7804 Linden Road, Wyndmoor, Philadelphia, Pa. as district manager for Eastern Pennsylvania, Southern New Jersey and Delaware.

Philips Export Company, 100 East 42nd Street, New York, has been appointed by **Standard Transformer Corp.**, Chicago, as sole export representative. They will handle all foreign trade, including export to Canada.

•

L. Philip Ertel Company, Commercial Trust Building, Philadelphia, Pa. has been named factory representative for the Middle Atlantic States for the **Adalet Manufacturing Company,** Cleveland, Ohio.

•

On March 1, the **Triangle Instruments Company** of 2937 West 36th Street, Brooklyn, N. Y., moved to new and larger quarters at 140 Liberty Street, New York, N. Y.

•

Laurence H. Beck has been appointed representative in the Michigan territory by the **Solar Light Manufacturing Company,** Chicago. He will make his headquarters at 141 West Parkhurst Place, Detroit, Mich.

•

The appointment of C. B. Swann as sales engineer has been announced by the **Pittsburgh Reflector Company,** Pittsburgh, Pa.

•

Enameled Metals Company has announced the appointment of Hemphill and Company, 446 E. Woodbridge St., Detroit, Mich. as sales representative for the state of Michigan.

•

Duro-Test Corporation, North Bergen, N. J. has named Patterson Electric (Ontario) Limited, Toronto, Canada, as distributor for all its lighting products.

•

Colonial Electric Products, Inc. of East Paterson, N. J. has announced the appointment of Joseph Plasencia, a New York exporter, as director of its export department to handle the sale of its cold cathode lamps and fixtures throughout most of the principal countries of the world.

•

FASCO Industries, Inc., Rochester, N Y. is constructing two new plant additions, increasing total floor space to approximately 250,000 square feet.

•

William A. Schaub has been named manager of the Denver district and Raymond P. Russell of the Boston district of the industrial products sales department of the **B. F. Goodrich Company.** John M. Cooney has been transferred from the Boston district to manager of the Akron, Ohio district.

USE AK-1 HOOK-ON VOLT-AMMETER
FOR REGULAR
PREVENTIVE MAINTENANCE!

By making regular periodic checks of your motor, wiring, and transformer loads, you can help prevent those costly shutdowns. You can also be sure you are getting efficient operation (by catching those loafers). It's easy this way to spot that over- or underloaded equipment before it costs you real money, or lost time.

SIMPLE OPERATION

Split-core transformer permits you to make current measurements without cutting conductors. Just hook it over conductor (any size up to 2 inches), and flip selector switch to desired range (0-15/60/150/600 amps). It's as easy as that.

Voltage measurements (0/150/600 volts) are made by connecting leads to voltage binding posts. To change from any one of these six measurement ranges to any other one, merely flip the selector switch.

YOU CAN GET THIS HANDY TESTING INSTRUMENT

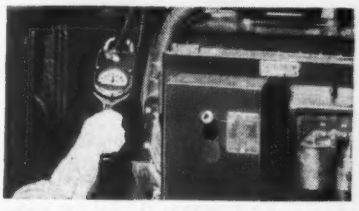
See your nearest dealer or G-E representative. If you want more details, write for Bulletin GEA-2950, Apparatus Department, General Electric Company, Schenectady 5, N. Y.

*Manufacturer's suggested retail price.

Measure current without cutting conductors

Measure current and voltage with one setup

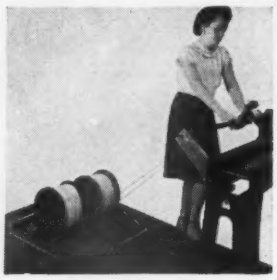
Meter load surveys save money


The AK-1 is made for tight places

GENERAL ELECTRIC

802-146

Master of them ALL—
DE-REELER



Amazingly low priced unit. Eliminates loss of time—accidents and the need for excess manpower. Saves space, money and time. DeReeler handles every type of reeled type products. There is a need for the DeReeler in industry. Following are some of the buyers—Coil Winding-Transformer and Switch Board Manufacturers—Repair Shops and Construction Contractors handling reeled type wire, rope and belting.

Handles Fully Loaded Various Size Reels

Model No. A	*Model No. B*
FROM	FROM
12" Dia. x 6" Width	17" Dia. x 8½" Width
To 28" Dia x 11" Width	To 32" Dia. x 19" Width
Model No. C	*Model No. D**
FROM	FROM
34" Dia. x 22" Width	50" Dia. x 38" Width
To 48" Dia. x 32" Width	To 96" Dia. x 71" Width

*This model for telephone—utility—or reels of 6,000 lbs. or over.

Some exclusive territories available—write today for yours.

ASSOCIATED AIRCRAFT AND AUTOMOTIVE ENTERPRISES
6215 South Damen Avenue Chicago 36, Illinois

A REALLY USEFUL SERVICE INSTRUMENT!
4 METERS IN 1
NEW MODEL B-6
MEGOHMER

❶ **Insulation Tester,** 0-200 megohms, 500 volts DC test potential. With exclusive triple-color grading scale.

❷ **Ohmmeter,** 0-2000 ohms.

❸ **AC Voltmeter,** 0-150/600 volts.

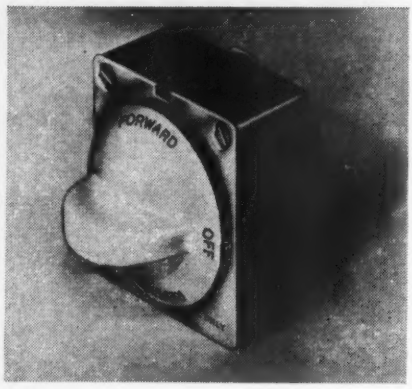
❹ **DC Voltmeter,** 0-150/300 volts.

Full details in Bulletin 441

HERMAN H. STICHT CO., INC.
27 PARK PLACE NEW YORK 7, N. Y.

Equipment News

[FROM PAGE 104]



Switch

A new manually operated, 4 position motor reversing switch rated to ¼ hp., 25 amp., 115 volt, a-c has been announced. Available either uni-directional or bi-rotary. It occupies about 6 cubic inches, measuring 2⅜ inches in height, 2⅛ inches in width and 1-13/64 inches in depth. In the original application, the uni-direction model automatically accomplishes the reversing action as the dial is turned clockwise to alternate on and off positions. Hart Mfg Co., Hartford, Conn.

Box Connectors

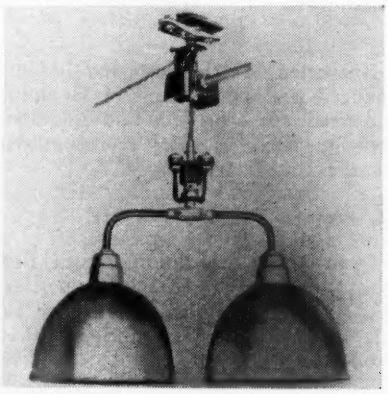
These new "Squeeze-Lock" box connectors provide simple, fast, positive and economical method for connecting metallic or non-metallic sheathed cable to device or outlet boxes. They provide for simultaneous clamping of connector onto cable and into box by the tightening of two screws. Installation is accomplished by hooking bottom tab into knockout, swinging connector to engage rocking clamp, and then tightening. They required no locknuts and feature accommodation of broad range of cable sizes. Both the No. B267 for armored cable and the No. R267 for loomwire or non-metallic sheathed cable are approved by UL and Canadian Standard Association. Buchanan Electrical Products Corp., 1290 Central Ave., Hillside, N. J.

Wall Heater

A new, thermostatically controlled, recessed wall heater series, which supplies both radiated heat and heat by convection has been announced. A built-in thermostat, which operates continuously whenever the heater's master switch is in the "On" position, automatically controls the heating elements and fan to maintain room temperature within a two-degree tolerance. Elements supplying the radiant heat include tubes of refractory material which attain the same heat intensity as wires which are coiled around them. A fan driven by an induction type motor which operates on 50-60 cycle a-c, forces cool air over the heating elements and into the room. Approved by UL. Markel Electric Products, Inc., and LaSalle Lighting Products, Inc., Buffalo, N. Y.

Motors

A line of new jet pump motors designed for automatic starting and stopping has been announced. They have the starting and accelerating torque and speed characteristics especially suited to jet pump service. The new capacitor start single phase jet pump motors are built to NEMA standards of performance and dimensions. Three phase and direct current motors have identical mounting dimensions, making them interchangeable. Century Electric Co., 1806 Pine St., St. Louis 3, Mo.



Hanger

Designed for use with twin or triple unit combinations of mercury and incandescent luminaires, the Series 300 (three-way four-wire) disconnecting and lowering hanger facilitates maintenance and repair operations and permits quick changes. This hanger can be used in any combination of circuits within its rated capacity. Individual control can be used for each circuit, and a triple unit can be wired in various lighting combinations for temporary or permanent needs. It features positive latching, accurate repositioning, constant polarity, equalized contact pressure, and manual control through the chain or cable used to lower and raise the luminaire. They are rated by UL at 15 amperes on 155 volt a-c and 7.5 amperes on 230 volt a-c. Thompson Electric Co., 1101 Power Avenue, Cleveland 14, Ohio.

Switch

Electrical contact switch to be used in the operation of lights, buzzers, alarms, signals, indicators and other applications calling for a contact making and/or breaking device of small dimensions has been developed. Designated as "CBN" contact switch, it is made only as single pole double throw, slow make and break for use on either a-c or d-c, at a maximum voltage of 250. Current rating is 2 amperes a-c, 1 ampere d-c. Contacts are silver to silver, mounted on phosphor bronze spring arms. Entire contact assembly is removable as a unit. Terminal screws are provided with formed washers for fastening of connecting wires; terminals are insulated from case and from each other. Sedgwick Machine Works, 60 Eighth Avenue, New York, N. Y.

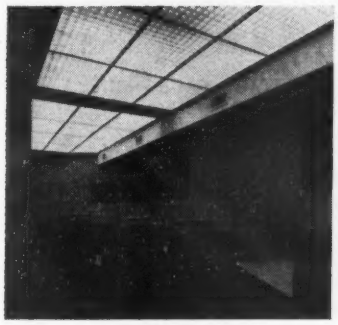
Electric Paving Breaker

A new 84 pound high cycle breaker, operated by electricity rather than by compressed air, has been developed. Electricity is supplied by a 129 pound dual voltage gasoline-engine-driven generator, which can be used for operating other types of high cycle tools as well as standard 110 volt tools and floodlights. Both breaker and generator make a compact combination that can fit in the trunk of a car and can be put into operation quickly by one man. It is unaffected by dust or abrasive particles. Motor has no brushes or commutator to wear out. There is no electrical connection between rotor and stator and sealed ball bearings support rotor shaft. Homelite Corporation, Port Chester, N. Y.

Combustion Control

A new Hazegage automatic combustion control is now available. Where fuel is burned instantly in the furnace, the haze density is an accurate index of the CO^2 content of the gases. Correct combustion is indicated by center reading on meter. At any desired limits on either side the red and green lights warn the operator

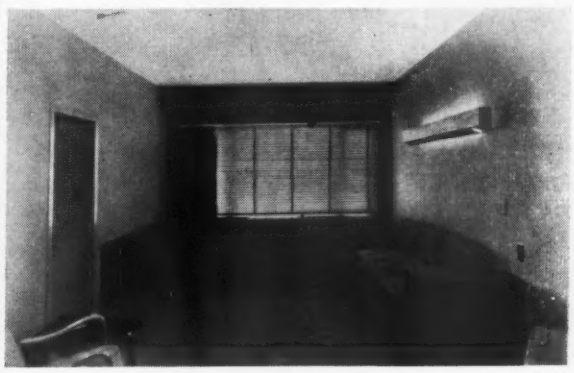
FULLERTON PRESENTS *engineered lighting* AT ITS BEST



CINCINNATI GAS & ELECTRIC CO.
Cincinnati, Ohio
This louverall ceiling produces high level lighting, using 40 watt fluorescent lamps on 12" centers with aluminum louvres, finished in baked white enamel. 3" x 3" x 3" cells for 45° cut off in all directions.

In addition to the lighting installation for Baker Library, Harvard University which is featured in this issue, Fullerton has also supplied the equipment for the following outstanding examples—

Right: C. CRAWFORD HOLLIDGE, LTD.
Wellsley, Mass.
Here is a well lighted specialty shop which effectively employs Full-O-Lite combination lighting equipment of 12-30w, 4-20w, 4-15w, and 1-32w circline fluorescent lamps. 1-150w PAR 38 spot with gimbal ring.



TERRACE PLAZA HOTEL
Cincinnati, Ohio
One of the many types of fixtures installed is the combination slimline and R30 spotlight unit for bedrooms.

Fullerton also manufactures standard fixtures for all convenient uses. These high quality lines are illustrated in a catalog just off press. Write for your copy now.

Leading architects and designers use the Fullerton "Engineering Know-How" in planning the lighting for stores, schools, hospitals, offices and all commercial uses.

Ask us to have a Full-O-Lite engineering representative call on you. He will give you complete help on your lighting requirements and problems.

FULLERTON MANUFACTURING CORPORATION
Specialists in Engineered Lighting Since 1926
MAKERS OF FULL-O-LITE FLUORESCENT, SLIMLINE AND INCANDESCENT FIXTURES
15 CHESTNUT STREET, SOUTH NORWALK, CONNECTICUT

SAVE TIME! SAVE MONEY!

with UNDERWRITER'S APPROVED

PAIGE #52 CONNECTORS

1. For non-metallic sheathed cable.

2. Press—Snap—Push. Installed in 7 seconds without tools.

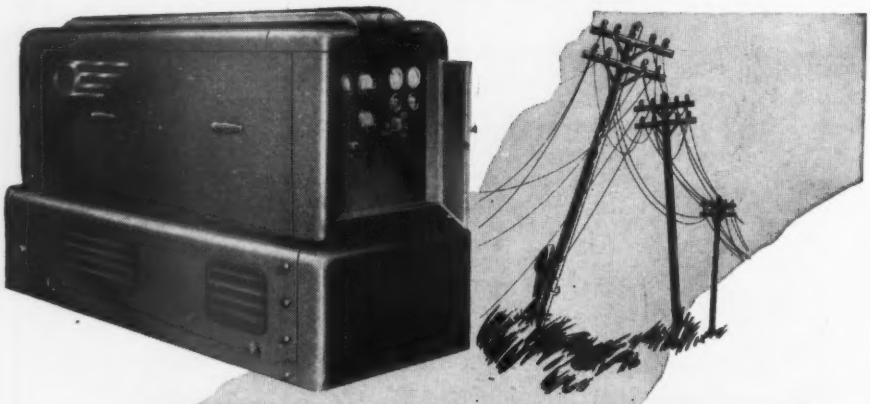
3. Holds cable firmly without screws or lock nuts.

EXCELLENT FOR STRAIN RELIEF

Request free sample and prices—NOW!

Dept. A 1 N. LASALLE STREET CHICAGO 2, ILLINOIS

ALLIED ELECTRICAL MFG. CORP.



Guard Against Costly Power Failures with

ONAN STANDBY ELECTRIC PLANTS

When power fails, business comes to a standstill. Materials in process are wasted, men and machines stand idle, lives may be endangered. Prevent the disastrous effects of power failure with a low-cost, easy-to-install Onan Standby System. The generating plant starts automatically when commercial power fails, takes over the power load without interruption, stops automatically when power is restored. Many models: 350 to 35,000 watts, A.C.

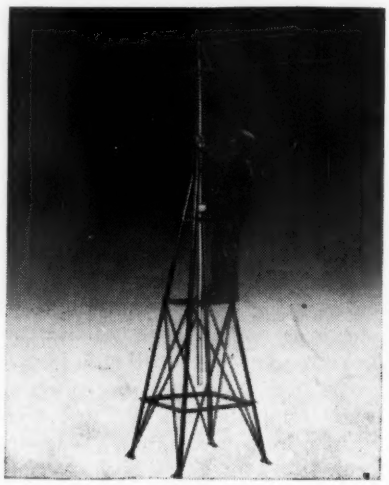
D. W. ONAN & SONS INC.

3164 Royalston Ave. • Minneapolis 5, Minn.

Onan PRODUCTS

ONAN STANDBY POWER

that haze is too dark or too light. Relays operated in connection with these lights control a reversible motor to correct the air ratio and return it to zone of good combustion. Air may be controlled by blower, damper or other regulating means. For smoke abatement control, the reversible motor may operate the valve controlling steam jets or controls to blower automatically supplying auxiliary air when needed. Ess Instrument Company, 96 S. Washington Ave., Bergenfield, N. J.



Towers

New self supporting towers for roof mounting of TV and FM receiving antennas have been announced. The towers are built in two heights—designed to accommodate a pipe extension which can be raised and lowered for ease of installation and service. Inclusive of the pipe extensions, these towers will support TV or FM receiving antennas 10 or 20 feet above the roof, respectively. All standard types of antennas may be securely attached to the extension pipe with a mast coupling which is furnished as part of the tower assembly. Design of tower makes possible easy installation on either sloping or flat roofs. Wincharger Corporation, Sioux City, Iowa.

Incandescent Lamps

A new inside finish for incandescent lamps has been announced. The special white finish is a silica substance which acts as a nearly perfect diffuser of light, yet permits high light transmission. It is being introduced in three new lamp bulbs, a 100-watt lamp, 100-200-300-watt three-lite lamp, and a 150-watt indirect-lite lamp. The new 100-watt lamps resemble the 100-watt inside-frosted lamps in size, shape and length of life. The 100-watt lamp is seen as having an application as a light

source in portable reading lamps which are not equipped with diffusing bowls. The 100-200-300-watt bulb is a counterpart of the inside-frosted lamp, and is intended for use in three-way portable lamps. The 150-watt lamps, having the shape of a sunlamp, with the face of the bulb five inches in diameter, introduces a method of obtaining higher illumination values and improved lighting qualities for many existing and new type floor, table, and wall lamps. General Electric Co., Nela Park, Cleveland 12, Ohio.

Cable

A new non-metallic sheathed cable, NE-o-Prene Loomwire, for barn, stable, milkhouse and other farm building wiring where rot, fungus, ice, moisture, are frequently destructive factors, has been introduced. It is approved by UL for use up to 600 volts, and is available in No. 14 and No. 12 wire sizes, in 2-conductor type, and in standard coil lengths. Features are: resistance to moisture, fire and rot; increased mechanical strength, smaller diameter, and a protective sheath of Neoprene. The two insulated conductors are spaced by a rubber separator which has incorporated within it twisted Fiberglas cords. Over conductors and spacer is a containing Fiberglas braid. Outer sheath of Neoprene. National Electric Products Corp., Chamber of Commerce Building Pittsburgh 19, Pa.

Ballast

A new ballast in which protection is provided against fluctuating line voltages by means of the constant voltage principle, has been introduced. It is for the operation of two 75 watt 96 inch slimline lamps. Features are: compact size—2⅝ in. high, 3⅛ in. wide and 11⅞ in. long; light weight; low wattage loss; constant wattage; quiet and cool in operation. Sola Electric Company, 4633 West 16th Street, Chicago, Ill.

Transformer

A new line of standard parts power transformers has been announced. They are available in the following sizes—three phase, 10,000 kva. and below, up to 34.5 kv.; single phase, 5,000 kva. and below, up to 34.5 kv. Identical parts may be used in several ratings and some variations may be made in some of the electrical characteristics. Pennsylvania Transformer Company, 808 Ridge Ave., Pittsburgh 12, Pa.

THEY FIT RIGHT!

Smoother, Easier, Installations

W

That's the big test of any Fitting, isn't it? A smooth, easy installation! And, to be sure of Fittings that do fit smoothly you must have a uniformity and exactness of product that can be depended upon *ALWAYS*. You're sure of this kind of Fitting when you specify Wagner Malleable.

Every step of production from molten metal to final inspection is carried out under the skill and watchfulness of Wagner workmen. Hourly tests are made in the modern metallurgical laboratory. From these reports, the proper controls are determined in order to produce the uniform, high quality malleable iron bearing the WAGNER mark. From here, down through every process, the finest facilities and vigilance of constant checking produce Fittings that fit right because they're made right!

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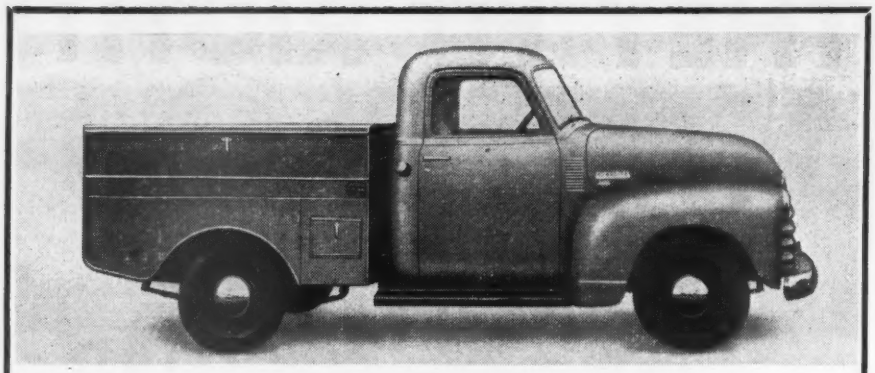

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SHIPPED PARTIALLY KNOCKED-DOWN TO CUSTOMER AT A LOW INITIAL COST

Model 60KD all steel service body, 75" long with generous side compartment space. Electric welded. Engineered for customer satisfaction. Designed for installation on a late model ½ ton chassis.

Lower shipping costs to you, due to small compact package. **Low priced** to you, because Model 60KD is jigged-constructed and produced in volume quantities.

Easy to assemble, requiring a minimum of time. Simple, easy to follow assembly drawing furnished.

Optional equipment available; 2 types overhead ladder racks, material trays, extension ladders.

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Presto! . . . and projecting ends are cleanly snapped off at the end of the slot. Nonflaring ends simplify insertions. Both features help reduce assembly time, cut labor costs.

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Nine standard sizes meet nearly all wedging applications. Available in 48" lengths, 500-foot bundles. Insist on Inmanco Wedges, whether formed fibre or wood. Write or phone, today, for more information.

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Fluorescent Fixture

Three new luminaires, "The Monroe"—A-5000 Series, have been added to this line of fluorescent lighting equipment. These units are especially designed for lighting schools, offices and similar applications. The units, using two 40 watt T-12 fluorescent lamps, are 48 in. long, 12½ in. wide and 5 in. deep. They may be ceiling or pendant mounted, individually or in continuous rows. Individual units include: the A-5240-PL with translucent plastic side-panels, the aluminum side panel A-5240-AL and the all-steel A-5240-ST. All three units have one piece, removable louver assemblies that allow easy access to wiring channels for installing. "Quick release" fittings allow hinging of baffle-bottom from either side or complete assembly removal. Knockouts permit any type of installation; adjustable hangers are used for individual or end-to-end pendant mounting. Pittsburgh Reflector Co., 404 Oliver Bldg., Pittsburgh 22, Pa.

Louverall Ceiling

New louverall ceiling with hinged panels and adjustable mounting brackets to line up ceiling and light fixtures has been announced. It is made of aluminum and forms continuous pattern of louver. Slimline or fluorescent fixtures are part of fixture. Panels are spot welded. Spot light panels available. Garden City Plating & Mfg. Co., 1750 No. Ashland Ave., Chicago 22, Ill.

Wall Heater

This built-in type of wall heater is based on the design principle that all heat generated by the radiant coils is driven out of the case by fan-blown air. Heater fits between standard studding in both new and old homes. A safety feature is a toggle switch guard. Supplied in standard 110-120 volt, 60 cycle a-c capacity, it is listed by UL. Front panel dimensions are 10 by 14 in. The back, or wall box dimensions are 3 by 9 by 12⅞ in. For use in bathroom, bedroom, nursery, servant's quarters, laundry room and recreation room. Titan Mfg. Co., Inc., Prudential Bldg., Buffalo 2, N. Y.

Lighting Fixture

A new sidewall fixture with fluorescent Circlarc bulb has been announced. It is for use in homes, workshops, offices, hotels or hospitals. It fits flush to wall and measures 14¼ in. long, 4⅛ in. wide, 6⅞ in. deep. It uses an 18 watt bulb. Finish is baked white enamel. It has a pull chain switch. Homecraft Electronic Products, 1208 S. Kedzie Ave., Chicago 23, Ill.

Cutout

A heavy-duty indicating cutout applicable to fusing sizeable transformer banks or sectionalizing heavy feeders has been announced. Rated at 200 amperes, it has been designed to provide an 8,000 ampere full-range interrupting rating at 2.5 kv. (or line-to-neutral on 4160 or 4330-volt Grd Y, 4-wire system) complementary to the original interrupting rating 5,000 amperes at 5 kv., (or line-to-neutral on 8330-volt Grd Y, 4-wire system). Cutout housing is of wet-process porcelain, glazed inside and out, with hangar support cemented into back. Door is molded of Textolite compound. Spring-operated indicator arm pulls cable downward. General Electric Co., Schenectady 5, N. Y.

Cable

A complete line of AVC, asbestos-varnished cambric, heat and flame resisting electrical wires and cables for shipboard use meeting AIEE standards, is now available. Cables are designed for use throughout a vessel in power, lighting, propulsion, telephone and communication circuits. AVC insulation, impregnated felted asbestos and varnished cambric, is protected by a new impervious sheath and basket weave metallic armor. Rockbestos Products Corp., New Haven 4, Conn.

Paging System

A silent paging system, called Visicall, has been announced. It is a silent visual type of paging service for installations where noise conditions are extreme and audible signals cannot be heard, or where audible signals and loud speakers will not be considered, such as in retail stores, executive offices, hospitals, etc. Each person subject to call is assigned a number from one to twelve, as his permanent call number, and he knows he is wanted when that number lights on all the Visicall light stations. They respond by a pre-arranged method, usually by

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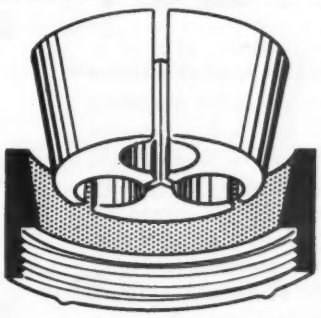
NOW you can use

SALI VERTICAL SUPPORTS

on Every Job

I LIKE THE WAY IT GRIPS! THE HEAVIER THE PULL, THE TIGHTER IT HOLDS THE CABLES



● Tapered Sali wedges hug each cable . . . grip it firmly *all around.* They're tough and dense—won't warp or break. (Photo shows one wedge removed). No other Vertical Support holds as well, or takes so little room. For any number of cables. *Prompt shipments.* Send card for full details and NEW LOW PRICES. *Adalet, 14300 Lorain Ave., Cleveland 11, O.*

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the new catalog showing every conduit fitting, coupling and accessory in the Kondu line.

Wide Variety

The most complete line of threadless fittings ever presented.

THREADLESS and THREADED

The Threaded Kondu fittings have covers and other accessories interchangeable with the Threadless line.

ALUMINUM ALLOY

used exclusively—2/3 less weight, with no sacrifice of strength. And they are practically corrosion-proof. Write for new catalog, showing complete Kondu line of conduit fittings and accessories.

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KONDU MFG. CO., LTD., Preston, Ontario

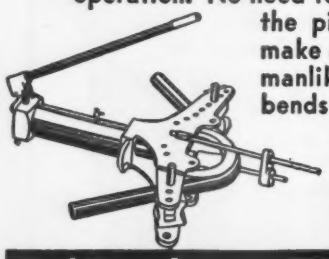
Bend Conduit Faster

up to 90 degees in one operation

Tal Bender

Here's How

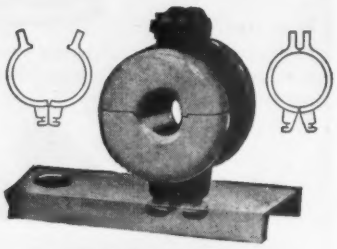
Installation work goes faster, easier, and at a lower cost when you have a Tal's Prestal Bender on the job. This efficient, light, portable machine handles all pipe and conduit up to 3". Makes perfect bends, up to 90°, cold, in one single operation. No need to waste labor by replacing the pipe three to six times to make a bend. Does a good workmanlike job — smooth, uniform bends without kinks or wrinkles. Simple and easy to operate. Thousands are in successful use everywhere. Write for data bulletin.

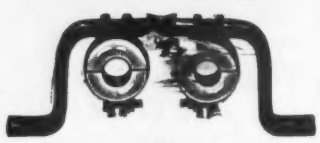


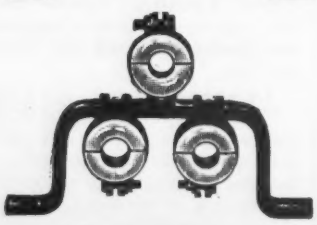
Tal Bender, Inc. Dept. 21 Milwaukee 2, Wis.

"EFFICIENCY" DEVICES FOR CONDUIT and CABLE SUSPENSION

Install cable quickly, easily and safely with... "Efficiency" NESTED CONDUCTOR RACKS







Designed to carry conductors equidistant from center to center . . . Efficiency patented racks feature porcelain bushings and require but one bolt to support bushing and clamp it to the steel frame. Clamps are separate, allowing independent installation of each cable line. Furnished for your requirements for cable from 5/16" to 2⅜" diameter.

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Efficiency ELECTRIC AND MANUFACTURING CO.

MANUFACTURERS OF EFFICIENCY ELECTRICAL DEVICES FOR CONDUIT, WIRE AND CABLE SUSPENSION

EAST PALESTINE, OHIO

contacting telephone operator at the switchboard. Single-face light-stations can be of the flush or surface mounting type. Double-face units are housed in surface type cabinets. They are made in four sizes, to call 12, 24, 36 or 48 persons. H. R. Kirkland Co., Morristown, N. J.

Lighting

A new lens-down-light using a colouvered plano-convex lens has been introduced. It is for use in homes or commercial buildings, and is known as "Calcu-lite". The verticals of the colouvered lens are opaqued with ceramic coloring. The lens is regressed a little above ceiling level. Lenses are available with black, coral, or white vertical risers. The inside of the lens is flat, and is stippled or "pebbled" to increase light dispension. The Calcu-lite has a cone of useful light of about 45 degrees. Diameters are of six, nine and eleven inches to accommodate bulbs of wattages ranging from 75 to 500. Lightolier Decorator Galleries, 11 East 36th Street, New York, N. Y.

Tester

A new Megohmer insulation tester has been added to this line of instruments. They can be supplied with three megohm ranges by range selector switch. All standard Megohmers have constant pressure, slip-clutch d-c generators, true cross coil ohmmeter movements with cobalt magnets. Five different models are available with ranges up to 2000 megohms; test potentials of 500 volts d-c and 1000 volts d-c. Instruments are supplied with 12 foot rubber-covered, test leads and a supply of megographs for recording insulation resistance measurements. Herman H. Sticht Co., Inc., 27 Park Place, New York 7, N. Y.

Inter-Communication System

The "Dynasonic Selector" is one of the features of the new "Chief Forty-Niner" inter-communication systems. The user selects, upon installation, the type of performance he desires of each unit, and he may change his selection at any time, in any way, his experience may indicate is desirable. System can be expanded or re-arranged without discarding original installation. Six, 20 and 30 capacity master stations can be used in the same system, and can be intermixed with staff stations. Another feature is the multi-matic selector, which provides 12, 20 and 30 sta-

tion capacity with 12 pushbuttons. It carries UL approval and is suitable for use in stores, offices, factories and institutions. Talk-A-Phone Co., 1512 South Pulaski Road, Chicago 23, Ill.

Battery Charger

A new completely redesigned battery charger for servicing the batteries of motorized hand lift trucks has been announced. Known as Chargette, it occupies a floor area of 10⅜ in. by 14⅝ in. The truck operator plugs together the charging cable connector and turns the pointer to "normal charge" position. Automatically, the charging current begins at the proper value and is controlled throughout the charge at rates prescribed by battery manufacturer; charger stops in case of power failure; when power is restored, charging resumes and the charger shuts down when the battery is fully charged. It is made in seven ratings. Electric Products Company, 1725 Clarkstone Road, Cleveland 12, Ohio.

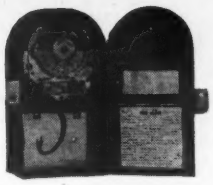
Fluorescent Units

A new fluorescent lighting unit for use in the kitchen has been announced. It has Bakelite ends and built-in sockets. Available in two types—The Fluradaptor can be plugged into any 4 inch incandescent holder. Equipped with cord and plug. The Flurafixture is a 5 in. flush type fixture for permanent mounting to an outlet box. Equipped with fixture strap, wire leads and screws. They use two 20 watt T-12 lamps. Dimensions are 7¾ in. wide, 24¾ in. long, 4⅝ in. high. Eagle Electric Mfg. Co., Inc., 23-10 Bridge Plaza South, Long Island City 1, N. Y.

New Equipment Briefs

Photoelectric smoke **indicator,** Type A-20C-1, indicates the density of smoke passing through the flue of a heating or power plant, and signals when this density approaches the values prescribed by municipal smoke ordinances. It is manufactured by Photoswitch Incorporated, Cambridge, Mass. . . . An **electric tool** called "Hamer-Dril" is for drilling tile, brick, cement, stone, in walls, in floors and overhead. Manufactured by Hamer-Dril, New York City. . . . Texas Foundries, Inc., Lufkin, Texas has announced improvements in two new lines of expanding **Texankers**

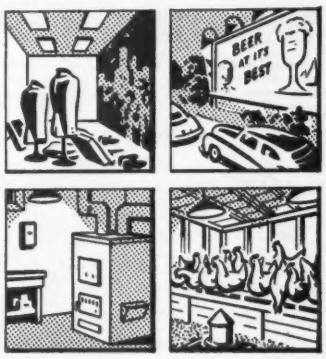
The Kemode Manufacturing Co., 2 West 46th Street, New York 19, N. Y. has announced a new **soldering iron.** . . . Automatic **start-stop control** for



SWITCH "ON" • REGULARLY • AUTOMATICALLY
SWITCH "OFF" • ELECTRICALLY

WITH A FAMOUS **TORK** TIME SWITCH
PLAIN OR ASTRONOMICAL

Tork Clock Time Switches are world renowned for their dependability and accuracy. They require no regular attention, and are available in many electrical capacities for both indoor and outdoor use.



There's a TORK CLOCK for every need.
Economically priced from $9.50
Send for free literature.

NEW! SPECIAL FEATURES
ASTRONOMIC "FOLLOW the SUN"
30 HOUR SPRING RESERVE.

TORK CLOCK CO., Inc.
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THE MAGNO-TRONIC FLUORESCENT STARTER

PROTECTS — Fully, automatic thermal relay with unusually long life that eliminates blinking lights and protects all auxiliary equipment.

SIMPLIFIES — Replacement of worn-out lamp automatically restores closed circuit—replacement of starter unnecessary. No button to push.

REDUCES COSTS — Magno-Tronic starters provide exact timing in the lamp electrode—preheating process preventing excessive loss of emission material, thereby assuring the maximum in the useful life of a lamp. The established quality of this starter saves considerable time in maintenance and man hours required to repair and/or replace an inoperative lighting unit.

VERSATILE — Will operate efficiently over an extended voltage range under widely varying temperatures.

GUARANTEED FOR ONE YEAR.

The (SP-15-20) for use with either 15 or 20 watt lamps
The (SP-30-40) for use with either 30 or 40 watt lamps
The (SP-100) for use with 100 watt lamps

Ask for descriptive literature
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MAIN PLANT Newark 2, N. J.

Jiffy
NO-KINK FISH TAPE

Pushes and pulls around four 90° bends in aluminum conduit and six in steel with ease. Rust proof aircraft control type cable, coil spring covered, will not kink, break or gouge. Slips past boxes and conduit ends no curling—requires fewer boxes and fittings. Lengths 35—50—100 feet.

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Box SUPPORT

These clamp in supports are easily installed and hold the switch box firmly in any wall, sheetrock, beaver board, lath and plaster, wood, metal lath, etc., without the use of any screws or nails.

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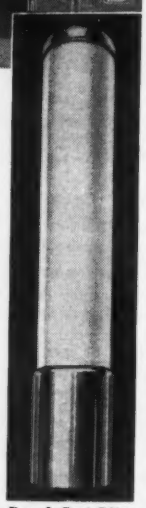
NEW BUSINESS for CONTRACTORS

The big development in outside business lighting is to the "new method of lighting" made possible by Post-Lites, the new all-weather fluorescents. These dramatic, stream-lined lights radiate light in all directions. They completely dominate any surroundings. Visible a mile away. Attract business like nothing else can. One installation sells others. This is your big opportunity!

Post-Lites are well engineered by a 38 year old company. Good in zero weather. Wide variety of types install on posts, walls, corners. Mail coupon for new Catalog.



Round Post-Lites straddle pipe posts.
Half-round Post-Lites mount on walls.
Also other models

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electric driven d-c welders is being manufactured by DV Welding Controls, Oakland, Calif. . . . Development and manufacture of a new one-trip **reel** for wire, made of Weldwood plywood and Tekwood, has been announced by United Specialties Associates, Inc., New York City.

Announcement has been made by the Electricoil Transformer Company, New York City, that its new high sensitivity portable insulation breakdown **tester** up to 11,000 volt a-c is ready for distribution. . . . The Penetone Company, Tenafly, N. J. has developed a **solvent emulsion cleaner,** known as Buxite, for removal of protective coatings and greases. . . . The Appliance Division of the Housing Foundation, Inc. Deep River, Conn. announces the release of a new, quick-action **soldering tool** called the Pres-To-Heat.

The Adjustable Fixture Co., Milwaukee, Wis. announces the "Ajusco-Loc" **Lighting socket protector.** . . . The George Ulanet Company, Newark, N. J. announces the addition of a new housed strip-type **thermostat** to its line. . . . Development of a new **fluorescent color**, called Vis-A-Ray, has been announced by Duro-Test Corporation, North Bergen, N. J.

The Superior Electric Company of Bristol, Conn., announces the production of a new Stabiline **voltage regulator** with a rated output of 0 to 250 volt-amperes. It is the instantaneous electronic type. . . . A new **blueprint cabinet,** built of heavy gauge furniture steel has been introduced by the Cole Steel Equipment Co., New York City. . . . The Chain-O-Flex Corp., Franklin Park, Ill. has announced a new flexible overhead chain **conveyor** for use where a constant flow of material or assembled products is needed. . . . For flame failure protection of semi-automatic and manually ignited industrial oil burners, Combustion Control Corporation, Cambridge, Mass., has introduced the **Fireye System** FF-3.

The new ICC Torchmaster is a general utility, self-contained **hand torch** using liquid petroleum gas as fuel. It is made by the Industrial Engineered Products Co., Los Angeles, Calif. . . .

The Baldor Electric Co., St. Louis, Mo. has announced the development of a window **fan** for use in homes, apartments, stores, work shops, offices, restaurant and other commercial uses. . . . General Lighting Company, Bronx, N. Y. has developed **louvers** for ceilings in cubes of 3, 2 and 1½ inches. Standard module is made up in 18 by 48 inch sections.

General Electric Co., Cleveland, Ohio, has announced the reduction of the bulb size of the 75 watt **incandescant lamp** from A-21 to A-19, the size of the present 60 watt lamp. . . . The Philip Carey Mfg. Company, Cincinnati, Ohio, has announced the addition of a new group of kitchen, window ventilating and attic **fans.** . . . FASCO Industries, Inc., Rochester, N. Y. has announced the new ArcticAire 16 inch oscillating **fans** for desk or wall mounting.

REVERE engineers have applied their years of experience to designing and crafting better equipment for Service Station, Airport, Sports, Industrial and Marine Lighting. They've done a top notch job you'll agree when you put any unit in our COMPLETE line to test!

New 20°—19° and 50° Flood for long range lighting. Every Sports Lighting Job, Railroad Yard, Golf Driving Range is a prospect. Has many unusual features for safety, ease of wiring and maintenance.

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REVERE ELECTRIC MFG. CO.
6017 Broadway Chicago 40, Illinois

ELECTRICIANS

Save time, hard work in tough masonry . . .

Drill it fast, easy with hard, diamond-like Kennametal Masonry Drills

Get Results Like This:

"50 holes—1½ inches deep in tile, per grind. Speed—40 seconds per hole."

"Average 100 holes, 3½ inches deep in cement between regrind. Speed—15 seconds per hole."

"Saved 7½ hours in one day with one bit. Go on new job tomorrow. Saved money—had easier going."

PLASTER, BRICK, TILE, LIMESTONE, CEMENT, are drilled up to 5 times as fast. The Kennadrill stays sharp up to 100 times longer. Blade action ejects the cuttings, prevents binding, sticking. Holes are clean, true, sharp edged. Bits are ¼" to 1½" in diameter. Can be used in hand braces, drill presses, light rotary drills. Write for bulletin EK now.

In Hardware Stores Everywhere

KENNAMETAL Inc. LATROBE, PA

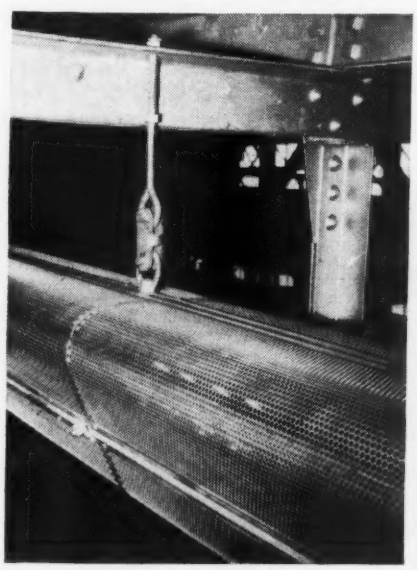
ENCLOSED MOTORS NEED DRAINS

[FROM PAGE 84]

The second and most popular method, is to use drains located at the bottom of the motor. In "Standard" (unlabeled) motors, the drain may be a tapped opening with a regular pipe plug which should be removed periodically to allow escape of any accumulated water. In fact, where "Standard" (unlabeled) motors are permissible, it is possible that in the majority of cases the plug is unnecessary.

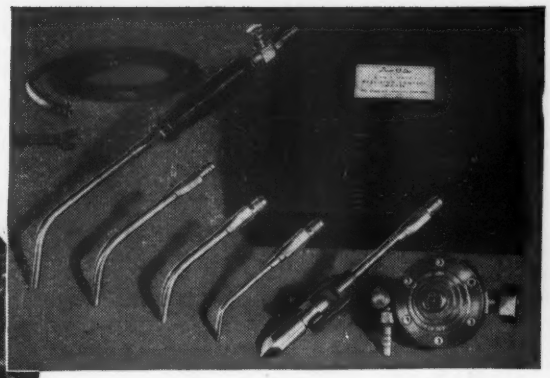
In the case of explosion-proof (labeled) motors, a special drain valve can be furnished which continuously permits escape of moisture accumulation. Figure 1 shows a typical installation of this type of drain. Since the drain is, in effect, an opening between outside and inside of motor, it must have Underwriters' approval, and *its attachment to the motor must be of a permanent nature.* For this reason, factory installation is preferred.

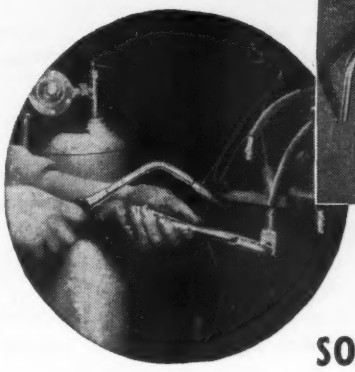
Breathers can also be applied to relieve the condition of air flowing in or out through the bearing closures. These drains (and breathers) for labeled motors are either brass—for ordinary conditions—or chrome or monel metal where corrosive agents are present in amounts sufficient to warrant these higher-priced metals. The small additional cost of drains and breathers is well worth considering where the combination of humidity and intermittent operation is present.



Double-clevis suspension of 3,500-ampere aluminum sector-bus duct on catwalk at ALCOA's new Davenport plant. Method minimizes duct movement due to expansion differential between aluminum duct and steel structure; also vibration set up by adjacent crane operation. After duct is leveled, lower nut is tightened.

Prest-O-Lite
Trade-Mark
5-in-1 Outfit





5-in-1 Precision Outfit . . . **$22.50**

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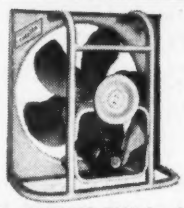

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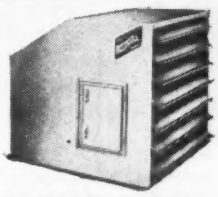

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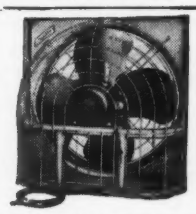

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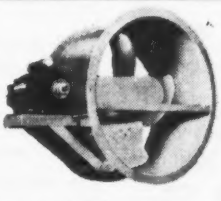

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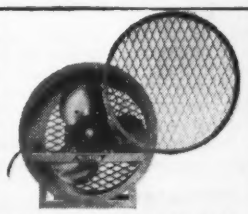

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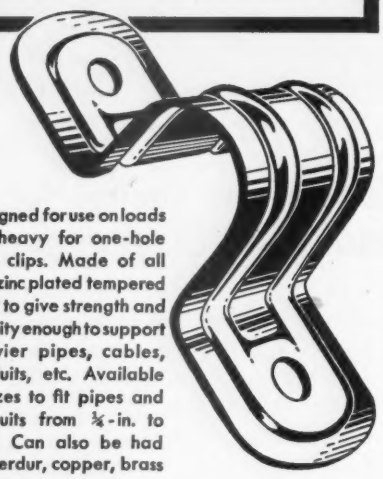

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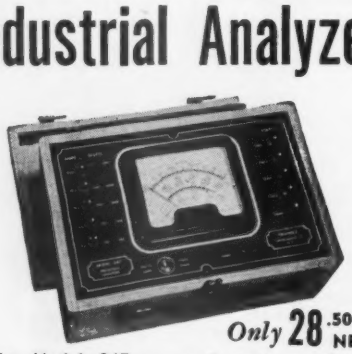

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INDUSTRIAL KITCHENS

[FROM PAGE 79]

area is further heightened by a series of 2-lamp 40-watt commercial fixtures suspended in a single row on 8-foot centers. To prevent the entrance of steam or other fumes, these suspended fixtures are totally enclosed with gasketed, hinged-glass covers. With the combined output from these suspended fixtures and the continuous reflector-strip, intensities are 60 footcandles in this selective display section.

In the kitchen area proper, 2-lamp vaporproof 40-watt fixtures on approximate 7-foot centers in either direction deliver an average of 43 footcandles, with special lighting installations augmenting this illumination where required. In this connection, vaporproof globes and guards are installed around lamps in the walk-in refrigerators, garbage-storage and bottle-cleaning areas, under the various fume hoods and on the loading platforms. Holophane brackets and prismatic-lensed units are installed at stair entrances and, to further safeguard employees using these stairways, stairs are illuminated by wall-recessed 100-watt step lights.

Wiring

Wiring throughout the cafeteria and kitchen area is 12-gauge or larger, with type R wire used in the cafeteria section, and RH generally specified in the kitchen. The exception to this rule is found in damp locations, such as beneath floors and inside refrigerators, where wiring is type TW. To further protect circuits from dampness, all conduits subjected to conditions of condensation are properly sloped and drained.

Lighting panels are dead front units with 3-phase 4-wire 208/120-volt mains and lugs, and multi-breakers operating on the thermal-magnetic principle. Panels are flush mounted in the glazed-tile walls, with panel doors set in chromium face plates. Control of the general lighting in the kitchen-cafeteria area is from three separate load centers, while all special lighting is activated from local switches. Of course, for maximum safety and control facility, all stair and corridor lights are operated from two or more locations.

In floor layout, the service counters separate the cafeteria area from the space occupied by the kitchen, dish pantry, salad preparation, butcher shop, bake shop, bottle storage, re-

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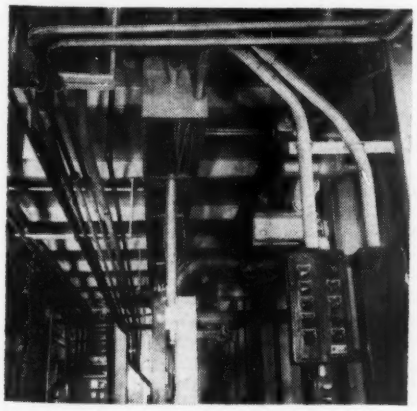
frigerated garbage room and walk-in refrigerators for meats, dairy products and vegetables. Service counters are so arranged that those wishing to be served may enter at either end and proceed towards the cashier counters in the middle. Both ends of the service counter carry such general items as trays, silver, soups and desserts. But beyond this, the two sections cater to different groups; one of which favors sandwiches and items from the griddle, while the other group is interested in hot plates and the steam table.

After diners have completed their meals, soiled dishes are placed on the conveyor which occupies one wall of the cafeteria and passes through the glazed-tile partition wall into the dish pantry. Here dishes are sorted, electrically washed, stacked on rolling trucks and transported back to the various stations for clean dishes, glassware and silver.

Although this discussion features the electrical installation in the cafeteria and kitchen area, it is of interest to note that the sound design and fine workmanship exhibited in these sections are typical of the entire building. As examples, on upper floors where space is primarily administrative, twin floor-ducts are used extensively, one carrying wiring for 120-volt receptacles and the other containing circuits for telephones and low voltage signal systems. Another interesting detail is the arrangement of 200-watt incandescent lighting fixtures recessed into the suspended ceiling. Since space above the ceiling level is used as a return air plenum chamber in the air conditioning system, the 12-inch square prismatic-lensed lighting units are sealed into the ceiling to prevent air leakage, and relamping is accomplished through hinged covers.



Long aluminum trough encloses control and instrument wiring under electric furnace at ALCOA's new Davenport plant. Conduit risers terminate in solid plates at bottom of trough. Sectionalized screw covers provide access to conductors.

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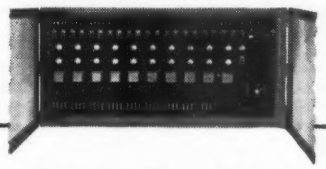

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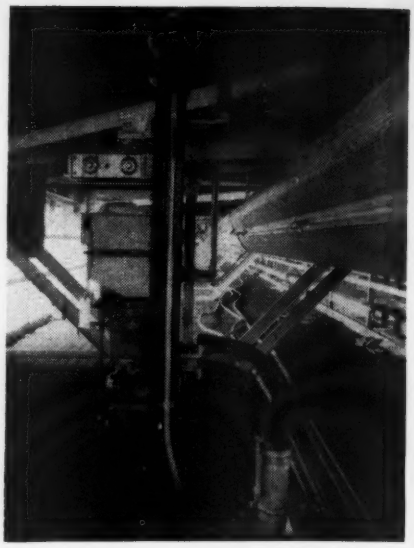

Motor-operated air circuit breaker (1600-a., 250 v. d-c) on electrical distribution catwalk in mill building of ALCOA's new Davenport plant serves crane feeders. Overhead cable connection from aluminum channel d-c bus at catwalk rail (right) is made to disconnect switch at top of panel. Aluminum feeder conduits (with aluminum cables) are supported by angle-iron flange and U-bolts at catwalk grate. Installation by Fischbach and Moore, Inc. D-c service is provided by two 500-kw. and four 300-kw. motor-generator sets located at heavy load centers.

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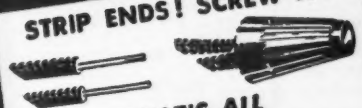

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Advertising In This Issue

Acme Electric Corp. 136
Adalet Mfg. Co. 179
Adam Electric Co., Frank 35
Allied Elec'l Mfg. Corp. 176
Allis-Chalmers Mfg. Co. 7, 28
All-Steel Equipment, Inc. 111
Alter Co., The Harry 186
Aluminum Co. of America 57
Anaconda Wire & Cable Co. ... 62
Appleton Electric Co. 2
Arro Expansion Bolt Co. 164
Arrow-Hart & Hegeman Electric Co., The 113
Artisan Products, Inc. 178
Associated Aircraft & Automotive Enterprises 174
Austin Co., The M. B. 156

Bakelite Corp. 23
Benjamin Electric Mfg. Co. 114
Biddle Co., James G. 42
Blackhawk Mfg. Co. 161
Briegel Method Tool Co. 129
Bryant Electric Co., The 52
Buffalo Forge Co. 167
BullDog Electric Products Co. .20, 21
Burndy Engineering Co., Inc. ... 39
Bussmann Mfg. Co. 122, 123

Cannon Elec. Development Co. ... 154
Century Electric Co. 121
Certified Ballast Mfrs. 137
Chelsea Fan & Blower Co., Inc. . 183
Clark Controller Co., The 53
Couch Co., Inc., S. H. 185
Crescent Ins. Wire & Cable Co. 37
Crouse-Hinds Co. 13
Curtis Lighting, Inc. 140, 141
Cutler-Hammer, Inc. 15

Day-Brite Lighting, Inc. 134
Dow Corning Corp. 130

Economy Fuse & Mfg. Co. 16
Efficiency Elec. & Mfg. Co. 180
Electrical Facilities, Inc. 94
Electro Mfg. Corp. 105

Fairbanks, Morse & Co. 95
Federal Electric Prod. Co. 43
Federal Enterprises, Inc. 21
Feedrail Corp. 93
Frankel Connector Co. 171
Fullerton Mfg. Corp. 175
Fullman Mfg. Co. 163

General Electric Co. (Apparatus Dept.) Second Cover, 5, 17, 18, 145, 153, 173
General Electric Co. (Chemical Dept.) 48
General Electric Co. (Construction Materials Dept.) Fourth Cover, 25, 96
General Electric Co. (Lamp Dept.) 29
General Switch Corp. 38
Graybar Electric Co., Inc. 64
Greenlee Tool Co. 110
Guth Co., The Edwin F. 92

Hazard Insulated Wire Works 103, 159
Howell Electric Motors Co. 119

Ideal Industries, Inc. 22
Ilg Elec. Ventilating Co. 102
Ilsco Copper Tube & Prod. Co. . 130
Industrial Electronics Corp. 181
Ingersoll-Rand 126
Insulation Manufacturers Corp. .. 178
Insulation & Wires, Inc. 125
Irvington Varnish & Ins. Co. 112
I-T-E Circuit Breaker Co. 101

Jenkins Bros. 4

Kennametal Inc. 182
Kett Tool Co., The 128
Keystone Mfg. Co. 168
Kirk & Blum Mfg. Co., The 36
Klein & Sons, Mathias 152
Kondu Corp. 179

Leader Electric Co. 19
Lighting Products, Inc. 139
Lightolier Co., The 8
Linde Air Prod. Co. (Unit of Union Carbide & Carbon Corp.) 183
Lint, Clyde W. 182
Long Co., W. H. 182

Marcus Transformer Co. 160
McGill Mfg. Co. 155
McGraw-Hill Book Co. 185
Midwest Electric Mfg. Co. 98
Minerallac Electric Co. 184
Mitchell Mfg. Co. 143
Mitchell-Rand Insulation Co., Inc. 109
Monarch Fuse Co. 165
Monowatt Incorporated 88, 89
Multi Electric Mfg. Co. 172
Murray Mfg. Corp. 1
M & W Electric Mfg. Co. 130

National Electric Coil Co. 170
National Electric Prod. Corp. .60, 85
Nelson Corp., The Herman 184

Okonite Co., The 103, 159
Onan & Sons, Inc., D. W. 176
Oster Mfg. Co., The 158
Owens-Corning Fiberglas Corp. 40 41
O. Z. Electrical Mfg. Co., Inc. .. 56

Paine Company 169
Penn Fluorescent Light Mfrs., Wm. 54
Pierce Renewable Fuses, Inc. 104
Pittsburgh Reflector Co. 30
Powder Power Tool Corp. 142
Post-Glover Electric Co., The ... 12
Pryne & Co., Inc. 26
Pyle-National Co., The 55

Quadrangle Mfg. Co. 166

Radio Corporation of America ... 44
Republic Steel Corp. 10, 11
Revere Electric Mfg. Co. 182
Richards Co., J. R. 34
Ridge Tool Co. 100
Robbins & Myers, Inc. 58
Rockbestos Products Corp. 6
Roebling's Sons Co., John A. 31
Rome Cable Corp. 146
Russell & Stoll Co., Inc. 50, 51

Sangamo Electric Co. 144
Sherman Mfg. Co., H. B. 138
Signal Engineering & Mfg. Co. .. 170
Simplex Wire & Cable Co. 90
Solar Electric Corp. 187
Sorgel Electric Co. 14
Spang-Chalfant (Div. of The National Supply Co.) 106
Square D Company .....Third Cover
Standard Electric Mfg. Co., Inc. 172
Standard Transformer Co., The .. 49
Steber Mfg. Co. 131
Steel City Electric Co. 27
Steel & Tubes Division 10, 11
Stemco Corp. 162
Steuland Mfg. Co. 187
Sticht Co., Inc., Herman H. 174
Superior Carbon Prod. Co., Inc. . 128
Sylvania Electric Products, Inc. 32, 33

Tal Bender, Inc. 180
Thompson Electric Co., The 124
Tork Clock Co. 181
Triangle Conduit & Cable Co., Inc. 9
Triangle Instruments Co. 184
Trumbull Electric Mfg. Co. 46

Union Carbide & Carbon Corp. . 183
United States Motors Corp. 118
United States Rubber Co. 150
Universal Motor Co. 108

Virden Co., John C. 47

Wagner Electric Corp. 127
Wagner Malleable Products Co. . 177
Westinghouse Electric Corp. (Pittsburgh) ...45, 59, 86, 132, 133
Where To Buy 187
Wodack Electric Tool Corp. 187

Youngstown Sheet & Tube Co. ... 149

■

PROFESSIONAL SERVICES .. 187

■

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT
Positions Vacant 186
Positions Wanted 186
EDUCATIONAL
Books 187
EQUIPMENT
(Used or Surplus New) For Sale 186, 187

The Election of November 2, 1948 GAVE NO MANDATE FOR SOCIALISM

The President and those who support his legislative program have objected to the substance of my previous editorial, which appeared under this headline: "Now is the Time to FIGHT SOCIALISM in Washington."

In that editorial I explained how Washington is poised to follow the disastrous policy of forcing industry to skimp on new plants and new equipment. That policy landed Britain in the numbing embrace of the Socialists. I cited the experience of Britain to show how such skimping on industrial tools can bring a nation to economic stagnation . . . and Socialism.

The President, in his recent Jackson Day speech, brushed aside this warning . . . "They are again trying to frighten the people with the old worn-out bugaboo that Socialism is taking over in Washington." Senator Francis J. Myers of Pennsylvania asserted that I was guilty of "warfare against any reasonable effort to keep our system of free enterprise working."

These criticisms may be sincere. But they are not well-founded.

I want to show why they are not well-founded by basing this editorial on Washington rather than Britain.

In Washington the Administration has proposed a legislative program, the key parts of which would clearly put the country far on the road to Socialism. Let us see how.

There are two steps in the process:

FIRST: The government by its taxation program undermines private industry so that it cannot provide itself with the necessary new plant and tools.

SECOND: The government itself steps in to provide the plants and equipment that it has blocked industry from getting. *That is Socialism.*

Here is how Washington is promoting Socialization of the steel industry—and of other industries.

Steel has been expanding its capacity and improving its equipment chiefly by plowing back its profits. During the last three years it has spent $1.4 billion for new plants and new tools. That was more than the companies had available from their own earnings. But profits provided more

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than half of that money—more than $700 million. The remainder came from loans and from depreciation reserves set aside out of the earnings to replace worn-out equipment.

Profits must continue to provide the funds needed to pay for the bulk of the steel industry's necessary expansion. That is because private citizens, their income slashed by heavy taxes, have not been willing to buy steel stocks even at prices ruinously low for the companies and their present stockholders. The stock market currently prices the mills and other facilities of the nation's principal steel-producing companies at far less than fifty percent of the cost of reproducing them.

Let us take another example. Profits are essential to expansion in the electric light and power industry also. This year private companies are planning to buy $2 billion worth of new plant and equipment. To do that without going overboard in debt, they must sell to the public some $300 million worth of common stock. A squeeze on their profits would make that sale virtually impossible.

For tens of thousands of small business enterprises profits afford virtually the only practical source of funds for new equipment and expansion.

In the face of these and many other examples that might be cited, what is the most effective way to prevent industry from re-equipping itself and expanding is capacity to meet our essential needs?

Obviously, it is to cut down profits. And that is what the Administration is trying to do. The President has declared that steel prices are too high, and is demanding that Congress raise taxes sharply on all corporations.

There you have the first step toward socializing industry.

Next comes step two. Have the government supply the tools and equipment which, by taxation, it prevents industry from getting.

The Administration has proposed legislation to carry out this second step. It is called the "Economic Stability Act of 1949," for short, the "Spence Bill."

This bill gives the President the power to provide industrial facilities—in steel, power or any other industry—where he finds that a shortage is hampering or is likely to hamper the economy.

True, the bill says that the government is not to construct new plants if private companies will do it through government loans, on terms prescribed by the President. That may be just one step short of complete socialization. But it is only a short step. And the Spence Bill authorizes the government to take that step.

By itself, the Administration's "Stability Act" sounds harmless enough. It would have the government build plants only as a last resort. But it provides also that if private enterprise cannot turn out all the goods the country needs, the government can and should step in and provide the equipment to do it.

Now, take that power together with an Administration tax program that undercuts the ability of private enterprise to supply the new plants and equipment it needs out of its own earnings. That combination promotes government ownership and operation of industry.

And that is Socialism.

The American people, of course, have the right to live under any system they choose—Capitalism, Socialism, Fascism, Communism, or what-have-you. But before Socialism or any other "ism" is imposed upon us from above, the people should know the facts. If this editorial shall have contributed in some small degree to that end it will have served its purpose.

The election of November 2, 1948 gave no mandate for Socialism.

James H. McGraw, Jr.

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